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'ORTIETH ANNUAL REPORT OF THE LOCAL GOVERNMENT BOARD, 1910-11.

SUPPLEMENT

IN CONTINUATION OF THE

PORT OF THE MEDICAL OFFICER OF THE BOARD

For 1910-11,

CONTAINING A

REPORT

ON

ISOLATION HOSPITALS

BY

H. FRANKLIN PARSONS, M.D.,

ith an Introduction by the Medical Officer of the Board.

'resented to both Houses of Parliament by Command of His Majesty.

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TO THE RIGHT HONOURABLE JOHN BURNS, M.P., PRESIDENT OF THE LOCAL GOVERNMENT BOARD.

SIR,

THE following report by Dr. Parsons gives the results of an enquiry, directed by the Board, into the cost of construction of isolation hospitals. This enquiry has been carried out by Dr. Parsons from time to time as opportunities occurred during his official connection with the Board, and has been completed by him since his retirement in 1911. The primary objects of the enquiry were to investigate the complaints received by the Board concerning the large and increasing cost of construction of isolation hospitals, and to furnish instances of satisfactory hospitals which had been erected at a reasonable cost, in order that local authorities bringing proposals before the Board, apparently too costly in character, might be referred to more economical examples of what was needed.

The report may be regarded as supplementing the report "On the Use and Influence of Hospitals for Infectious Diseases" by the late Sir R. Thorne Thorne, F.R.S., which was issued by the Board in 1882, and was extremely useful in its time. This report was reprinted in 1900, with a preface giving later information up to that date. Since 1882, however, medical knowledge respecting infectious diseases has grown, and the need for considering each infectious disease as a separate problem has become more evident. During the same time increased practical experience has been gained of the working of isolation hospitals, whilst there have been material changes in the law relating to them, and in popular feeling towards their use. It appeared, therefore, that in some respects the general questions of isolation hospitals and of their economical construction needed reconsideration and re-statement.

Dr. Parsons's report contains information which will be very valuable to sanitary authorities and their officers in preparing plans for isolation hospitals. A number of points of practical importance may be referred to under this heading.

So far as the area which may be conveniently served by an isolation hospital is concerned, it is pointed out that circumstances have considerably changed since Sir R. T. Thorne prepared his report; the recent improvements in means of communication and transport enabling a hospital to serve a

considerably larger area than was formerly thought practicable. The provision of a single joint hospital for a number of small districts enables important advantages, as regards both economy and efficiency, to be secured which are seldom practicable for small separate hospitals. This is especially the case for small-pox hospitals which may conveniently serve a larger area than those for other acute infectious diseases.

In a chapter on the cost of isolation hospitals, Dr. Parsons shows that the common practice of estimating the cost of hospitals as so much per bed gives rise to fallacious comparisons unless the size and suitability of the hospital are taken into account; a small hospital costing more per bed than a large hospital, as the cost of the site and the administrative buildings cannot be proportionally less in the former case.

In the past twenty years, the cost of isolation hospitals has increased; in part because of a greater desire for efficiency on the part of local authorities, and in part because of the increased cost of labour and of building materials. An isolation hospital of medium size commonly varies in cost between £300 and £500 per bed; but £500 per bed has often been exceeded. Very high prices per bed have sometimes been due to inexperience of the architect, to want of due regard to economy in design, or to insufficient supervision and control over the cost of erection. More often the excessive cost has been caused by the high price paid for the site, or by the heavy expenses involved in preparing it for building. Owing to the objections commonly raised to the establishment of an isolation hospital in a locality, it often happens that a local authority finds it necessary to purchase a larger or more costly site than would otherwise be required, and to incur heavy legal expenses in meeting opposition. The site, furthermore, if in an isolated situation, may entail large expenditure in respect of water supply, drainage and other requisites, road making, cartage of materials, &c.; and due allowance for these special expenses, which are reckoned among the costs of building, is not always made when a comparison of the cost of buildings, exclusive of site, is instituted.

Temporary buildings, such as iron hospitals, though apparently much cheaper than permanent buildings of brick or stone, are in reality less so than they appear. A practical comparison between temporary and permanent buildings can only be made when the cost of site, foundations, water supply and drainage, furniture and other requisites is included; and

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these may sometimes be more expensive than the building itself. The ready inflammability and the imperfect protection against extremes of weather afforded by temporary buildings have also to be borne in mind.

It rests chiefly with the local authority to keep the cost of providing a hospital within reasonable and moderate limits. The chief suggestions which have been made by Dr. Parsons to meet this end are, the combination for hospital purposes of small districts into suitable areas of sufficient size ; careful selection and judicious purchase of a site ; the employment of a competent architect ; the avoidance of superfluities and unnecessary ornament, and careful supervision over the progress of the erection ; and the reduction of the space in some instances to 1,872 cubic feet for each patient. In this connection Mr. Kitchin's Memorandum appended to this report should be carefully studied.

The second part of the report contains a description of a number of the hospitals which were visited by Dr. Parsons in the course of the enquiry, with comparison of their cost, mentioning any circumstances which may have tended to raise or lower it. Many of the visits were paid in company with Mr. Kitchin, the Board's Architect. The visits often brought to light points of interest in connection with hospital provision and administration, such as the size of the hospital in relation to the area served by it ; the degree of suitability and durability of temporary buildings ; staff arrangements ; and the precautions taken to prevent the spread of infection from convalescent patients on their return home. These will be found under the heading of the individual hospitals.

In Chapter VI. on Compartment and Cubicle Blocks Dr. Parsons describes some of the more modern methods of hospital provision, which have been designed with a view to the prevention of cross-infection. Experience cannot be said to have yet finally decided the relative merits of these different arrangements, nor the question as to the special circumstances under which one or another of them is specially indicated ; but it may be hoped that in the next few years the numerous trials now being made of modified methods of hospital treatment will enable the administration of isolation hospitals to be placed on a more completely satisfactory basis.

Incidentally it became necessary for Dr. Parsons to consider in some degree, particularly in relation to scarlet fever, the extent to which the use of isolation hospitals can be regarded as of value in preventing the spread of disease.

He points out that in every district of considerable magnitude, cases of infectious disease must be expected from time to time to occur in which removal to a hospital is imperatively needed, either because the patient is destitute of the accommodation and necessaries required for his own well-being, or because his circumstances and surroundings are such as to involve danger to the public. It will be matter of common agreement that hospital accommodation on a scale sufficing to meet this need should be provided. There will, furthermore, be no doubt as to the utility of a hospital in providing for the isolation of initial and specially urgent cases. Doubts have been expressed as to whether the routine removal to hospital of the majority of notified cases of scarlet fever has had as great an effect in checking the course of epidemics of this disease, as might have been anticipated. Furthermore, when the attempt at hospital treatment on a large scale has led to overcrowding of the hospital, and precautions against cross-infection have been defective, mischief has been done, which has diminished the utility of the hospital. The utility of isolation hospitals for scarlet fever cannot however be considered separately from that of the other administrative efforts in each district for the efficient control of scarlet fever. The institutional segregation of notified cases cannot realise its potential value, unless it is associated with diligent search for unrecognised cases of the disease. This is of special importance when, as in recent years, the prevalent type of the disease is very mild. In view of the fact that the disease is extremely infectious at its earliest stages, early diagnosis and isolation is necessary, if isolation is to attain its full possibilities of success.

It is likely that experience now being obtained may shew the practicability of curtailing somewhat the duration of institutional treatment of the majority of cases of scarlet fever. Cautious experimentation and observation will in the course of time enable more exact rules to be formulated in this respect.

Between the two extremes of removal to hospital of the great majority of cases, and of removal only of cases of exceptional urgency, all varieties of practice occur in different districts. Where a suitable hospital has been provided, the tendency is for the public themselves to demand removal in an increasing proportion of cases ; and irrespective of the question as to the influence of such removal on the general course of an epidemic, this practice constitutes an immense social convenience, permitting the early resumption of all the duties of life by the members of the invaded family. There is

therefore no likelihood of isolation hospitals for scarlet fever ceasing to be required.

An Appendix to Dr. Parsons's report contains :—

A. The Board's Memorandum of 1902 "On the provision of isolation hospital accommodation by local authorities," with appendix issued in 1908. This memorandum sets forth the Board's requirements in the case of isolation hospitals erected under their sanction.

B. An account by Dr. Theodore Thomson of the cubicle wards at the Pasteur Hospital and at the Hospital for Sick Children, Paris.

C. A comparison, by Dr. Parsons, of the cost of isolation hospitals and lunatic asylums.

D. A memorandum by the Board's Architect, Mr. Kitchin, on the cost of isolation hospitals.

I am, Sir,

Your obedient Servant,

ARTHUR NEWSHOLME.

July, 1912.

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PART I.—GENERAL REPORT.

CHAPTER I.

Introductory.

In the year 1882 a Report "On the Use and Influence of Hospitals for Infectious Diseases" by the late Sir Richard Thorne was issued as a supplement to the Tenth Annual Report of the Local Government Board, 1880-81. This report consisted of two parts, viz.:—

I. A general report dealing with the history, functions and requisites of hospitals for infectious diseases, and

II. Local hospital reports, giving descriptions of a number of the hospitals for infectious diseases, which had up to that date been erected in England and Wales.

In 1900 a new edition of Sir R. Thorne's report was issued with a preface signed by the Board's then Medical Officer, Sir W. H. Power, in which it was pointed out that while the general considerations set forth in the first part of the report still held good, needing material modification only in one respect (to be mentioned in Chapter III. of this report), none of the individual hospitals described in the second part of the report afforded models which could with advantage be closely followed at the present day.

It is proposed in the present report to describe some of the more modern developments in the design of isolation hospitals especially from the point of view of utility in the treatment of the sick; and also, in view of representations which have been made on the subject, to consider the question of the cost of isolation hospitals, and the practicability of certain suggestions which have been made for reducing it.

For the purpose of this inquiry a number of modern isolation hospitals have been visited, most of which are described in the second part of this report. It was originally intended that the report should be made jointly with Mr. Kitchin, the Board's Architect, and in many of the earlier visits to hospitals I had the advantage of his co-operation, but latterly the pressure of other official engagements has unfortunately prevented his presence. A memorandum by him is appended to this report.

Some of the hospitals visited have been selected as examples which may be useful to local authorities who propose erecting establishments of this sort, of isolation hospitals which have been found efficiently to fulfil the requirements of such hospitals, and have been erected at a moderate cost. Among these may be mentioned the hospitals in the Settle Rural district, and in the Stroud, Penistone and Waltham Joint Hospital districts.

Others of the hospitals visited, on the other hand, have been expensive ones, reckoned as cost per bed. This has more often been found to be due to circumstances connected with the site than to actual extravagance in the construction of the buildings.

With a view to ascertain how far the high cost of isolation hospitals may be attributable, as is sometimes asserted, to the requirements of the Local Government Board, several permanent hospitals have been visited which have been erected by town councils under local Acts of Parliament or otherwise without the Board's approval being needed. Examples are the Rhondda, Huddersfield, Plaistow (West Ham), and Bagthorpe (Nottingham) hospitals; and it was not found that these hospitals were less elaborate in design, or had cost less per bed than might have been the case if they had been erected under the Board's sanction.

Other visits to hospitals were for the purpose of examining special features of construction, as the cubicle wards at the Walthamstow, East Ham and Croydon Rural hospitals, or special methods of administration, as the "open air" treatment at the Bagthorpe Hospital (Nottingham).

The visits often brought to light points of interest in connection with hospital provision and administration, such as the size of the hospital in relation to the area served by it; the suitability and duration of temporary buildings, and the precautions taken to prevent the spread of infection from convalescent patients on their return to their homes.

The statements and conclusions in the first, or general, part of this report are not, however, based solely on what has been learnt at visits to the hospitals described in the second part of the report. Various other hospitals have been visited by me at different times which I have not thought it necessary to describe; and much information concerning local experience of the construction and management of isolation hospitals has been obtained from reports of medical officers of health, and at conferences at Whitehall with local authorities on hospital questions.

CHAPTER II.

Utility of Isolation Hospitals.

It is not the purpose of this report to investigate exhaustively the influence of isolation hospitals upon the prevalence of infectious disease; but consideration of the question cannot altogether be avoided. It may be admitted that their usefulness in arresting an outbreak of infectious disease at an early stage is more obvious than their usefulness in extinguishing a developed epidemic, or in reducing the prevalence of a disease endemically present in a community.

In favour of the utility of isolation hospitals, it may be pointed out that—of the four diseases ordinarily treated in such hospitals, viz., scarlet fever, enteric fever, diphtheria and smallpox—the mortality from the two former has steadily declined

during the past 30 years, a period during which the provision and use of isolation hospitals has been becoming more general, while the mortality from the two latter has also decreased in recent years—in the case of diphtheria after an increase in the nineties, and in that of small-pox, after a series of fluctuations. On the other hand, the diminution of mortality in the same period from measles and whooping-cough, infectious diseases which are not often treated in hospital, has been much less than in that from scarlet fever and enteric fever, and measles has shown little tendency to diminish during the past decade—*see* the following table:—

Table I.—Annual Mortality in England and Wales per million persons living from:

Period.	Scarlet Fever.	Enteric Fever.	Diphtheria.	Small-pox.	Measles.	Whooping Cough.
5 years, 1881–85 ...	436	216	156	78	413	459
5 years, 1886–90 ...	241	179	170	14	468	444
5 years, 1891–95 ...	182	174	253	20	407	398
5 years, 1896–1900	135	175	272	7	421	359
5 years, 1901–5 ...	126	113	204	25	326	300
5 years, 1906–10 ...	85	69	151	0·3	287	248
1906	101	92	177	1	273	241
1907	92	67	164	0	361	293
1908	80	75	157	0	226	278
1909	90	60	146	0	353	201
1910	*65*	*51*	*115*	*0·5*	*226*	*237*

It may, however, be contended on the other side, that the diminished mortality from scarlet fever is due to the milder type of the disease as it at present exists, and is not confined to districts in which hospital isolation is practised; that the diminished mortality from enteric fever may be accounted for by the reduced prevalence of the disease owing to the sanitary improvements which have been effected in the past 30 years; while the diminution in the mortality from diphtheria has accompanied the coming into use of the antitoxin treatment which was introduced about 1895.

There can be no question that the timely isolation of an imported or initial case of infectious disease is often followed by no further spread, nor that cases often occur under circumstances in which to allow them to remain at home may be fraught with danger to the general public; as when they occur among the family of a milk seller, or at a post office or frequented place of business; or where their remaining where they are might involve serious pecuniary loss, as at an hotel or a boarding school. There are also instances in which the patient has not proper lodging and accommodation for his own well-being, nor for the prevention of the spread of infectious disease to other persons in the same building, *e.g.*, at a common lodging-house

or in crowded homes of people of the poorer class. Such emergencies must be expected to occur from time to time in every district of any size above the smallest, and a town or district council which has not provided hospital accommodation adequate and suitable for coping with them must be regarded as having failed in one of its obvious duties for the protection of the public health.

The utility of hospital isolation in cases such as are mentioned above is not, so far as I am aware, seriously challenged; the doubts which have been raised as to its usefulness apply rather to the removal to hospital as a routine practice, as far as possible, of every case of infectious disease irrespective of home conditions; and they also apply more especially in the case of scarlet fever. Diphtheria and enteric fever are much more formidable diseases than scarlet fever is at the present day, and have a higher case-mortality. The patient's welfare and even his life often depend upon his getting better nursing and more suitable food than he is able to obtain in his own home, and enteric fever especially is very liable to spread in households of the poorer class, under the conditions of want of care in nursing and inattention to cleanliness which are apt to be there met with. Nevertheless—owing perhaps to the traditions of a time when scarlet fever was a more dangerous disease than it usually is now, and, no doubt largely, to the inconvenience occasioned by its prolonged infectiousness—it is scarlet fever which is often looked upon as the disease for which hospital accommodation is especially intended; and the Local Government Board have indeed, in some instances, found it necessary to remonstrate with local authorities for reserving their hospitals solely for cases of scarlet fever to the exclusion of cases of diphtheria and enteric fever, for which it would have been more useful.* Another bad result of the attempt to isolate in hospital every case of scarlet fever during an epidemic, in the absence of sufficient accommodation to meet the maximum requirements, is the liability to overcrowd the wards to the detriment of the patients. Thus at Weymouth, Dr. Sweeting reported that in 1900, during an epidemic of scarlet fever, the attempt to isolate every patient in the hospital of the port sanitary authority, which afforded insufficient accommodation for the purpose, led to great overcrowding, with the result that the administration of the hospital entirely broke down in many particulars; "return" cases "had not been uncommon," and it was doubtful how far the stringent removal of patients to hospital had been of value in controlling the epidemic.† In his report in 1894 on "Reinvasion by Scarlatina of households to which persons from the Bromley and Beckenham Joint Hospital had returned on their recovery from that disease," Mr. T. W. Thompson found that "return cases" were mainly limited to the two years of the rise and climax of the epidemic of scarlet fever in

* There are on the other hand hospitals, *e.g.*, some in South Wales, which are reserved for diphtheria and enteric fever, scarlet fever not being received.

† The town council have now provided an isolation hospital of their own.

1892-3, and for the most part to the former of those years. During that period, and especially towards the end of 1892, the acute wards had been made to accommodate more than twice the number of patients for which they were designed. He considered it possible that the overcrowding of the hospital which had occurred might in rare instances have led to reinfection and consequent renewal of actual infectiousness of patients, even though the patients had been transferred from the fever wards to an entirely separate convalescent block a fortnight before their discharge from the hospital.

At a public inquiry held at Darlington in 1904, the medical officer of health stated in evidence that the overcrowding of the wards had had a prejudicial effect both on the recovery of the patients and on the health of the nurses; and similarly at an inquiry at West Bromwich, it was stated that upon one occasion when about twice as many patients were being isolated in the hospital as would be allowable under the Board's standard, there were an unusual number of fatal septic complications of scarlet fever, such as mastoid disease. (In this latter case the overcrowding arose partly through the hospital being used for the reception of cases on payment from an adjoining district.)

Between the extreme courses which have been followed in particular districts, on the one hand, of removing or attempting to remove every case of scarlet fever to hospital, and on the other hand of not attempting removal in any case or of limiting it to circumstances of especial urgency, there lie a large number of instances in which local conditions will properly have weight in determining the proportion of cases in which removal is expedient. Thus in districts in which many of the inhabitants get their living in ways which would be interfered with by the occurrence of infectious disease in their households—*e.g.*, by letting lodgings at a health resort, by keeping boarding schools, or by laundry or other home work—the demand for hospital accommodation for scarlet fever will be greater than, say, in an agricultural or mining district. But even in districts in which such special needs do not exist, where a hospital which commands public confidence has been provided, the householder, especially if of the working class, often desires to be relieved of the irksome precautions, prolonged quarantine, exclusion of children from school, and other inconveniences which an attack of scarlet fever in his household involves, and may regard the amount which he pays through the rates for the upkeep of the hospital as an expense which it is worth incurring by way of insurance.

The following table shows in respect of scarlet fever in London during the 21 years 1891-1910, the notification rate, death rate and case mortality; the proportion of cases removed to the hospitals of the Metropolitan Asylums Board and the case mortality among cases so removed.*

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* Similar figures for Nottingham are given on pp. 106 and 107 of this report.

Table II.—Scarlet Fever in London.

Year.	Notifications per 1,000 population.*		Deaths per 1,000 population.*		Case mortality per cent.		Percentage of cases removed to hospital.		Case mortality per cent. in hospitals.	
1890 ...	3·7		·21		5·6		42·8		7·9	
1891 ...	2·7		·14		5·1		46·8		6·7	
1892 ...	6·4		·27		4·3		48·8		7·3	
1893 ...	8·6		·37		4·3		39·7		6·1	
1894 ...	4·3		·22		5·2		63·9		5·9	
1895 ...	4·5		·19		4·2		58·2		5·4	
1896 ...	5·7	Average of 10 years, 4·8.	·21	Average of 10 years, ·19.	3·7	Average of 10 years, 3·8.	62·6	Average of 10 years, 61·0.	4·3	Average of 10 years, 4·9
1897 ...	5·1		·18		3·4		67·0		4·1	
1898 ...	3·8		·13		3·4		73·2		4·1	
1899 ...	4·1		·09		2·2		74·3		2·6	
1900 ...	3·1		·08		2·6		75·1		3·0	
1901 ...	4·1		·13		3·2		78·9		3·8	
1902 ...	3·9		·12		3·1		80·3		3·4	
1903 ...	2·8		·08		2·9		83·8		3·1	
1904 ...	3·0		·08		2·7		84·5		3·4	
1905 ...	4·3		·12		2·8		88·6		3·3	
1906 ...	4·4	Average of 10 years, 3·8.	·12	Average of 10 years, ·10.	2·6	Average of 10 years, 2·7.	88·5	Average of 10 years, 86·1.	2·9	Average of 10 years, 3·0.
1907 ...	5·8		·14		2·5		89·4		2·8	
1908 ...	4·8		·12		2·5		90·9		2·6	
1909 ...	3·8		·08		2·2		90·2		2·3	
1910 ...	2·5		·05		2·0		85·6		2·3	

This table shows that during the period of 21 years there was a steady increase in the proportion of cases of scarlet fever treated in the hospitals of the Metropolitan Asylums Board, the proportion in some recent years having amounted to 90 per cent. of the total number notified, or double the proportion so treated 20 years ago. Together with this increase in the proportion of scarlet fever cases removed to hospital, there has been in proportion to population a diminution in the number of cases notified, and a still greater diminution in the number of deaths. Comparing the period of 10 years, 1891-1900, with the period of 10 years, 1901-1910, there has been in the average death rate from scarlet fever a diminution of 47 per cent., viz., from ·19 to ·10 per 1,000—this diminution being made up of one of 19 per cent. (from 4·8 to 3·9) in the case rate in conjunction with a lesser proportion of notified cases which proved fatal—2·7 instead of 3·8 per cent.—equal to a diminution in case mortality of 29 per cent.

The notification of infectious diseases became compulsory in London only in 1889, and if it may be assumed that it was less completely carried out at first than in later years the actual reduction of scarlet fever incidence would be greater than is shown in the table. There is, therefore, some ground for the view that the wholesale isolation of scarlet fever in London has not been without effect in reducing the prevalence of the disease.

* These rates are calculated on an estimated population based on an assumption that the slight decrease of the population of London which was shown by the census of 1911 was spread over the whole period of 1901-11. They are therefore in the years since 1901 slightly higher than the published rates, which are based on the assumptoin that the population increased in the years following 1901 at the same rate that it did in the period 1891-1901.

The diminished incidence of scarlet fever in London may be attributable in part to a change in the age distribution of the population, with a smaller proportion of persons under 10 years of age; *i.e.*, of those at the most susceptible period of life—due to the recent falling off of the birth-rate. The extent of influence of this factor cannot be estimated until the complete results of the census of 1911 are known, but it is not likely to account for the whole of the diminution in the notified cases of scarlet fever.

That the practice of isolating scarlet fever cases in hospital, even where carried out so completely as in London, has not produced a greater diminution in the prevalence of the disease is attributable to the following circumstances:—

1. The occurrence of unrecognised or unnotified cases. These cases are numerous during the present mild phase of scarlet fever, and frequently form a source of infection at school and elsewhere.

2. Notification and removal to hospital of the first patient often do not take place until after other members of the household have already contracted infection; scarlet fever—contrary to an idea which formerly prevailed—being infectious from the very commencement of the disease. To quote from a report by Dr. Williamson, medical officer of health for the Epsom and Dorking Combined District, appended to a report by Dr. Seaton to the Surrey County Council in 1908, "Sixty per cent. of the secondary cases (of scarlet fever) were already infected before notification or removal of the first case; from the end of the first week until the end of the sixth week the effect of removal (*i.e.*, in the prevention of the occurrence of other cases in the household invaded) is evident; it continues to a slight extent for the next four weeks, but is then considerably discounted by the high proportion of cases following on the return of the patient from hospital."

3. The liability, alluded to in the sentence just quoted, to the occurrence of further cases of scarlet fever, commonly called "return cases," in a household after the return of a convalescent from hospital, is perhaps the circumstance which more than any other has raised doubts of the utility of hospital isolation. According to a report by Dr. F. M. Turner, medical superintendent to the South-Eastern Hospital of the Metropolitan Asylums Board, appended to the annual report of that Board for 1909, in the years 1906-9 the proportion of subsequent outbreaks of scarlet fever to scarlet fever cases discharged from hospital was 4 per cent., and of subsequent outbreaks of diphtheria to diphtheria patients discharged, 0·75 per cent. There were also a few cases of outbreaks of scarlet fever after return of diphtheria patients and *vice versâ*.

The liability of scarlet fever convalescents to prolonged or recurrent infectivity, leading to the occurrence of "return cases" is not confined to patients who have been treated in hospital,* though probably most marked in them. It is not obviated by prolonged detention in hospital, and the infection appears to persist in mucous discharges from the nostrils, throat or other organs, rather than in the desquamating epidermis of

* *See e.g.*, p 71 of this report.

the skin. The following are among the measures which have been employed with a view to avoid the occurrence of "return cases" after discharge of patients:—

1. Prolonged detention of patients in hospital.

2. Removal of convalescent patients from the wards for acute cases to a convalescent block for a week or two before their discharge.

3. A warm bath and entire change of clothing either immediately before discharge, or preferably (in order to avoid the risk of catarrh with mucous discharge and recurrence of infection) a day or so before discharge, the patient meanwhile remaining in an uninfected ward.

4. A printed caution given to parents on the discharge of a patient, warning them to keep him or her for two or three weeks away from school and as far as possible apart from other children.

5. The sucking of lozenges containing a disinfectant drug.

6. Operative measures for the removal of any conditions of the throat, such as adenoids or enlarged tonsils, which might favour retention of infection.

It cannot be said, however, that by the use of any such measures the occurrence of return cases can be wholly prevented in the absence of any bacteriological or other means of determining whether a scarlet fever convalescent is, or is not, in an infectious condition.*

In diphtheria and enteric fever also there are cases in which infection persists long after recovery, whether the patient has been treated in hospital or not; and these "carrier cases" are no doubt accountable for many sporadic outbreaks of the respective diseases; but in these diseases there are bacteriological means of recognising the persistence of an infectious condition.

As regards the comparative case mortality among patients treated in hospital and at home, it is not possible to demonstrate by figures the advantage or otherwise of hospital treatment to the patient suffering from infectious disease, for the reason that the comparative mortality of hospital and home-treated cases depends largely on the initial severity of the cases as influencing removal. If only the more severe cases, or those who have been exposed to unfavourable conditions, are removed to hospital, and the mild and well-cared-for cases are left at home, the mortality among the former must be expected to be greater than among the latter, quite irrespective of any supposed hospital influence or of any unfavourable effect of the journey to the hospital. In London, where some 86 per cent. or more of the notified cases of scarlet fever are removed to hospital, the case mortality among the small residuum of cases not removed is very low; such cases being presumably in large proportion mild or doubtful ones, or patients of a well-to-do class living under favourable home conditions. On the other hand, in outbreaks of more formidable diseases, such as diphtheria and enteric fever, it may happen that the worst cases either die before removal could be carried out, or are too ill to bear the journey, and the inclusion of such cases among the home-treated would tend to raise

* *See* footnote on p. 135.

the case mortality of this class of cases as compared with the hospital-treated ones, irrespective of any favourable effect of hospital treatment.

Apart, however, from such considerations, it is obvious on general grounds that where the patient is able to bear removal his transference from a confined and perhaps crowded and dirty room with unskilled attendance, to a clean and airy hospital ward with suitable nourishment, good nursing, and medical care must tend to his well-being and recovery. Medical officers of health have in past years often been able to record a considerably lower mortality among cases treated in hospital than among those treated at home.

Thus at Huddersfield the medical officer of health in his annual report for 1899 states that on the average of the previous ten years the mortality per cent. of scarlet fever cases treated in hospital had been 3·18, of those treated at home 17·8; of enteric fever cases treated in hospital the mortality was 18·7 per cent., of those treated at home 34·4 per cent.

At Brighton, according to the annual report for 1900 of Dr. Newsholme, then medical officer of health for that town, on the average of the nine years 1892-1900, the case mortality was 3·5 per cent. among cases treated at home, and 2·0 per cent. among those treated in hospital, although 80·9 per cent. of the cases were removed to hospital, and those treated at home were so, in many cases, because they were of a higher social status and could be safely isolated at home.

It has been suggested that the hospital isolation of scarlet fever may be rendered unnecessary by the adoption of the treatment by inunction with eucalyptus oil formerly advocated by the late Mr. Brendon Curgenven (Transactions of Epidemiological Society of London, 1889-90, p. 93), and recently revived in a modified form by Dr. Robert Milne (Transactions of Epidemiological Section, Royal Society of Medicine, 1909-10).

The treatment as carried out by Dr. Milne consists, 1st, in the application of pure eucalyptus oil, gently rubbed in, over the whole body, from the crown of the head to the soles of the feet. During the first four days, in a scarlet fever case, the application is made twice a day, morning and evening, and afterwards once a day until the 10th day of the disease; 2nd in the swabbing of the tonsils and pharynx with carbolic oil (1 in 10) every two hours for the first 24 hours, rarely longer. It is claimed by Dr. Milne that his experience at Dr. Barnardo's Homes shows that when this treatment is commenced early—and he emphasises the point that early treatment is vital—secondary infection never occurs and complications are unknown, and that the infectiveness of the patient is neutralized to such an extent that other children may safely occupy the same room or even sleep in the same bed.

There has been a difference of opinion as to the value of the eucalyptus treatment by those who have used it in hospital practice in the past, and Dr. Milne's results call for verification by other observers. If the value of his method should be established it might reduce the amount of provision necessary for scarlet fever cases in hospitals; but it cannot be expected, for the following reasons, wholly or very largely to obviate the need for such provision.

1st. It is laid down by Dr. Milne that in order for the treatment to be effectual in preventing spread of infection, it must be

applied at the very commencement of the illness. This condition can be complied with in an institution such as an orphanage, where the children are continually under observation, and the initial symptoms of scarlet fever, such as sore throat, vomiting, and feverishness, can be at once detected; but it cannot be complied with in the general community where, as we have already seen, notification of the case is often not received until two or three days after its commencement, when other persons have already contracted infection.

It may be for this reason that the experience of hospital superintendents who have tried this method on scarlet fever cases in hospital has not been favourable. Thus Dr. Biernacki says that tested for a year at the Plaistow hospital in every case of scarlet fever admitted to the hospital the treatment, in the absence of the usual "barrier methods,"* which were intermitted during the time that Dr. Milne's treatment was under trial, failed to control infection. Cross infections became commoner; an unusual number of probationers acquired scarlet fever in the course of their duties; a larger proportion of doubtful cases of scarlet fever developed the disease after going to the convalescent home; and the percentage of "return cases" rose above the average. This adverse result, except perhaps in respect of the "return cases," could not be put down to coincidence.

2nd. The carrying out of the treatment would be impracticable in most households, especially those of the poorer class, without the aid of a trained nurse. It has been suggested that the local authority should be empowered by law to employ nurses for the purpose, but as one nurse could not carry out the treatment with the prescribed frequency, in more than a very few cases at a time, especially if scattered in different households, the employment of nurses on a scale sufficient to cope with a serious outbreak of scarlet fever would probably be impracticable.

3rd. Removal to hospital would still be needed in a certain proportion of cases, owing to the patient not having proper accommodation at his place of residence or to the case occurring under circumstances involving special danger or alarm to the public.

From what has been said above, it will appear that there is no near prospect that local authorities will find it unnecessary to be provided with hospital accommodation for the isolation of infectious diseases other than small-pox, though the scale on which such accommodation may be needed will vary in different districts according to local conditions, and in view of legitimate differences of opinion among local authorities and their advisers with respect to the extent to which it is advisable to resort to hospital isolation, more especially of scarlet fever cases. Although the number of cases of infectious diseases occurring in a district may decline, the tendency is for admission to hospital to be desired in an increasing measure for the cases that do occur, and, moreover, where a satisfactory hospital has been provided it often happens that other neighbouring local authorities desire to join in its use rather than provide separate accommodation of their own. Isolation hospitals,

* *See* Chapter VI., also Proceedings of the Royal Society of Medicine, Section for the study of Disease in Children, 1911, p. 179.

too, when not in use for the acute infectious diseases are now frequently used for the reception of cases of pulmonary tuberculosis, especially those in the early stage, with a view to carrying out open air treatment and instructing the patient in hygienic habits of life. There is, therefore, little likelihood that an isolation hospital provided for a district of suitable size will long remain without occasion for its use.

As regards small-pox there is no question of the value of isolation in a suitably situated hospital in preventing the spread of the disease. In view of the active and far-reaching nature of the infection and the persistence with which it attaches itself to places and articles of clothing and bedding, a case of small-pox left at home is a greater danger to susceptible persons in the house or neighbourhood than one of scarlet fever or diphtheria, and the dread which the disease inspires usually renders the patient's friends willing to allow removal and local authorities anxious to effect it. With the increasing proportion of the population who are unprotected by vaccination, it has become more important to place the small-pox patient where he will be surrounded only by a cordon of efficiently vaccinated persons. On the other hand, there is no evidence in the case of small-pox of that occasional chronic persistence of infection in persons who have apparently recovered which lessens the value of isolation for the prevention of scarlet fever, diphtheria, and enteric fever. So pressing is the need regarded for the isolation of cases of small-pox when they occur, that authorities who are unprovided with hospital accommodation are ready, on such an emergency, to incur considerable expense in improvising a temporary place for their reception or in sending patients many miles to a distant hospital where they can be received. Indeed isolation hospitals have not unfrequently had their origin in a building originally provided on the occasion of an outbreak of small-pox; which subsequently in the absence of that disease has been used for other infectious diseases, and when the advantages of hospital isolation have thus come to be recognised, has either been enlarged or replaced by a more permanent and suitable building.

But for small-pox hospitals to be effectual in preventing the spread of the disease, it is essential that they should be situated at a safe distance from populous areas. So long as small-pox was treated in the hospitals of the Metropolitan Asylums Board in London, the disease continued prevalent year by year, and Sir G. Buchanan before the Royal Commission on hospitals in 1882, was compelled regretfully to admit that statistics afforded no evidence of the hospitals with their many excellences, having diminished the mortality from small-pox in London. But the removal in 1885 of small-pox cases to hospitals outside London, instead of within the metropolitan area, brought about an abrupt change, and though minor prevalences of small-pox, originating in imported infection, occurred in 1893-5 and in 1901-2, it is not too much to say that since 1885 small-pox has ceased to be endemic in London. This is illustrated by the following table which shows the death-rates from small-pox per million inhabitants in London, including those of Londoners occurring outside the London area, from 1876 to 1910.

Table III.—Deaths from Small-pox in London.

Year.	Rate per million.	Average of 5 years.
1876	207	
1877	710	
1878	388	310
1879	121	
1880	125	
1881	619	
1882	111	
1883	35	282
1884	313	
1885	332	
1886	5	
1887	2	
1888	2	2
1889	0	
1890	1	
1891	2	
1892	7	
1893	43	17
1894	21	
1895	13	
1896	2	
1897	4	
1898	0	1·6
1899	1	
1900	1	
1901	51	
1902	282	
1903	3	69
1904	5	
1905	2	
1906	—	
1907	—	
1908	—	0
1909	0	
1910	—	

But while the utility of an efficient hospital for the isolation of small-pox cases is obvious when the disease occurs, it must be admitted that the expense of erecting such a hospital in a remote situation, where drainage and water supply and other facilities are likely to be absent, and of maintaining it in readiness to receive cases and with an adequate staff during the long periods that it may be void of patients are very considerable, and local authorities in this country may well envy those of Germany where owing to the universal enforcement of vaccination and re-vaccination special hospitals for small-pox are unnecessary (*see* Dr. Bruce Low's " Report on the arrangements in Germany for the isolation of small-pox cases " in the appendix to the annual report of the medical officer of the Local Government Board for 1903-4).

The following recommendations may be made with a view to diminish unproductive expenditure in the provision and maintenance of small-pox hospitals:—

1st. Combination of districts. For reasons to be mentioned in the next chapter of this report, joint action for the provision of small-pox hospitals is especially desirable, and the area which a small-pox hospital may serve is considerably greater than that which can conveniently be served by one for other infectious diseases.

2nd. The accommodation provided should be of the simplest and least expensive kind consistent with efficient administration. Ornament and luxury are quite out of place, especially in view of the class of people from whom the majority of small-pox patients come; and expensive labour-saving appliances which may repay their cost in an institution which is continuously occupied will not do so, and are liable to deteriorate, in one which may be unoccupied for long periods.

3rd. The small-pox hospital may be utilised, at times when it is not likely to be required for its primary purpose, in other ways, *e.g.*, as a sanatorium for phthisis cases, or as a convalescent hospital for scarlet fever cases, for which purposes its open situation should render it suitable. But if thus utilised arrangements should be made beforehand by which it can be immediately cleared of patients and made ready for small-pox in the event of a case of that disease occurring.

CHAPTER III.

Hospital Areas and Advantages of Combination for Hospital Provision.

In the case of districts of small area or population or of limited resources, combination for the purpose of hospital provision has been found to possess distinct advantages, both as regards economy and efficiency, as compared with the establishment of a separate hospital for each district. This is especially the case with hospitals for small-pox, a disease in which there is seldom any objection to removal of the patient, and in which patients have often been found to bear a journey of many miles without injury. In many instances it has been found advantageous to form, for the purpose of providing small-pox hospitals, separate combined areas, more extensive and embracing a larger number of districts than the combined areas formed for providing hospitals for other infectious diseases.

The extent of the area suitable for combination will vary with topographical and other circumstances. An important borough or a town of considerable size will generally prefer to have a hospital of its own; but smaller districts in its neighbourhood may conveniently make arrangements for the reception into it of their cases of infectious disease, and the terms of such an arrangement should be embodied in a formal agreement.

In the more rural parts of the country a market town with the surrounding rural district, or the whole of the districts comprised in one poor law union will often be found to form an area of a

size and conformation to be conveniently served, for diseases other than small-pox, by a single isolation hospital, which for facility of administration may be placed somewhere in the neighbourhood of the principal town. Indeed the existing poor law unions were largely formed on similar principles, one of the chief objects held in view having been to group together the parishes which could be conveniently served by a single workhouse. Where a poor law union extends into more than one county the districts in it cannot be formed into a hospital district under the Isolation Hospitals Acts, but other modes of combination are available in this case.

Among the advantages of the combination of districts, if not very large, for the purpose of hospital provision, as compared with the establishment of a separate hospital for each district, the following may be mentioned:—

I. By the establishment of a single hospital in place of two or more hospitals, one site only has to be obtained, and the number of possible or feared foci of infection is limited; the duplication of various buildings and appliances is avoided, and the cost of fencing and other requirements, proportionately to the number of beds, is reduced.

Thus an isolation hospital, however small, would require provision for

(1) a wardblock for patients,

(2) quarters for the staff,

(3) laundry and other out offices,

and these should be in separate buildings. Hence, having regard to the need for placing these buildings at a proper distance from the boundary and from each other, and, it may be, for ground on which to dispose of sewage and refuse, the site for a hospital, however small, can rarely be less than one acre. But the administrative and laundry accommodation which would be required for a hospital of only one small wardblock would suffice, with comparatively small increase, for a larger wardblock, or for two or even more wardblocks; and a site of two acres would thus afford space for buildings capable of holding many more than twice the number of patients who could be placed on a site of only one acre. A site of one acre, if rectangular and measuring 40 by 121 yards, would require 322 yards of fencing to enclose it, but a site of the same length, if 80 yards wide, would contain two acres instead of one, and yet would require only 80 yards additional fencing. Similarly with water supply, sewage disposal and other matters, works which would be necessary for a hospital, however small, would serve with comparatively small additions for one considerably larger.

II. The classification of patients in relation to the diseases from which they are suffering is facilitated by combination. In a district, however small, if provision has to be made for the isolation at one time of two diseases in patients of both sexes, there must be two pairs of wards, each pair having no direct aërial communication with the other pair. But the same number of wards may serve for the isolation of the diseases likely to be met with at one time in a considerably larger population, and if

the size of the wards may have to be increased this can be effected by merely adding to their length, which is a less costly matter than erecting a new block.

It has been suggested that the object of classification of diseases might be effected by arrangement between authorities possessing separate hospitals, by reserving the hospital of one authority for cases of one disease from both districts, and that of the other authority for another disease. This plan, however, would still involve the construction, equipment, and maintenance of two hospitals instead of one at an increased cost. Unless the districts were small it might also involve the removal of patients for too great distances. There might also be difficulties in respect of cases of mixed infectious nature, or which proved to be of a different nature to that supposed when they were sent in.

III. Combination enables a more efficient staff to be maintained. A hospital serving a small district may be empty for prolonged periods, but this is less likely to happen with a hospital serving a larger area in which infectious diseases will probably not be equally prevalent at the same time in every part. Hence for the latter it will be worth while to retain permanently a competent staff, a course which may be impracticable for a small hospital, often empty.*

Moreover, below a certain point, the number of staff required does not diminish in proportion to the number of beds. For a wardblock, however small—say of only two beds—if containing patients seriously ill, two nurses, one by day and one by night, may be required, for whom accommodation will have to be provided, but the same number of nurses may suffice for a larger wardblock, containing, say, 6 beds. The addition of another wardblock might involve a proportional increase in the number of nurses, but not in the other staff, *e.g.*, one caretaker would still suffice.

Notwithstanding these obvious advantages, it is often difficult to induce local authorities to combine for hospital provision. Sometimes the objection arises from a desire to manage their own affairs independently, or from the jealousy and mistrust of one another which are, unfortunately, too commonly met with among neighbouring local authorities.

Sometimes local authorities fear that if a joint hospital district were formed the hospital for the combined district might be placed in or near their district, so that patients from other places might be brought into their own district or conveyed by road through it, involving, as they think, greater risk of infection than if the hospital were for the use of their own district alone. The experience of the Board's medical department does not, however, support either of these objections. Except in the special case of hospitals for small-pox, there is no evidence that infectious disease ever spreads to the surrounding population from an isolation hospital at which the buildings are placed at

* A scheme devised by the county medical officers of Gloucestershire and Worcestershire for the interchange of nurses between isolation hospitals as occasion may require, with a view to reduction of cost of maintenance of staff when not needed, will be found on p. 122 of this Report.

a suitable distance from the boundary and are enclosed by a proper fence in accordance with the Board's requirements; and which is properly administered.

Nor is there any evidence that danger to the public arises from the conveyance through the streets of persons suffering from infectious diseases, if effected in a proper ambulance and with ordinary care.

This question was very carefully gone into by Mr. (now Sir W. H.) Power in his report of 1881 "On the Influence of the Fulham Hospital on the neighbourhood surrounding it," and he found that during the six days when the chief spread of small-pox had taken place all the ambulances except two arriving at the hospital had come by a single route which traversed the part of the surrounding area which had suffered least in the outbreak. "While fully admitting that any mischief which ambulances might have been able to effect would not have been confined to residents in streets or places through which they passed, yet it would assuredly be imputing too much to the agency, direct or indirect, of these vehicles to conceive of them as causing small-pox in 20 or 30 houses in a variety of directions away from their line of route, while they did not distribute even the same relative amount of small-pox along the line of route itself." Of all the persons attacked in the special outbreak only one had any relation with ambulances or ambulance drivers, and in the case of this individual there had been other opportunity for receiving infection.

In this connection the following remarks from the annual report for 1897 of the medical officer of health of the rural district of Chester-le-Street may also be quoted.

"With reference to Chester-le-Street, during the latter months of 1895, and the first two months of 1896, twenty-six scarlet fever patients were ambulanced along the South Burns, yet during the period in question, and for months afterwards, only one case of scarlet fever occurred in that street, and that case was distinctly traced to contact with a case of scarlet fever in Pelton Fell. So much for the danger of spreading scarlet fever during removal.

With reference to the suggestion that the hospital propagates scarlet fever, the following figures speak for themselves. During 1896, ninety-one cases of scarlet fever occurred in Chester-le-Street village. If a line be drawn from the west end of Foundry Lane to the east end of the Low Chare, the village will be divided into two practically equal portions, one a north division, lying nearer the hospital, and a south division lying further from the hospital. Of the 91 cases just mentioned, 58 or 63·7 per cent. occurred in the southern division, and 33 cases or 36·3 per cent. in the northern, or that division nearer the hospital. In 1897, 24 cases occurred in the village, and of these 17 or 70·8 per cent. were in that division of the village lying further away from the hospital, and seven cases or 29·2 per cent. in the northern half."

Another reason sometimes given for objecting to the formation of a combined district for the purpose of the provision of an

isolation hospital is that in a large area the distances which patients would have to be conveyed would be so great as to render the hospital useless for the more remote parts, as the patients would not be able to bear removal so far without injury, or the parents would be unwilling to allow them to be removed; and in this connection the views of Sir Richard Thorne in the report already mentioned have been quoted. From his experience Sir R. Thorne formed the opinion that a hospital should if possible be within the limits of the district for which it was erected and that in order to be reasonably available it should, in the case of a town, be distant not much more than two miles, and in the case of a rural district, not more than four or five miles from the populous parts of the district. He did not indeed find that removal for a distance of some five or even eight or ten miles in a well constructed ambulance and over ordinarily good roads had appeared to do harm to patients, provided their removal had been effected at an early stage of their illness, but he found that the relations and friends assented much more readily to their removal to a hospital within an easy distance than to a more distant one.

But in this respect subsequent experience has shown that Sir R. Thorne's dictum needs modification in view of the altered circumstances of the present time. With modern improvements in means of communication and transport, *e.g.*, telephones, ambulances with india-rubber tyres, and motor vehicles, and with increased public appreciation of the advantages of hospital treatment, the objection to removal of patients to a distance from their homes in most parts of the country has much diminished—indeed the popular feeling has gone so far in the opposite direction that it is now sometimes complained of by parents as a hardship if their children when suffering from an infectious disease have to be treated at home.

Local authorities, moreover, sometimes contend that they can provide their district with sufficient means of isolation at less expense by separate action than by entering into a combination. This, however, generally means that they consider that a cheap temporary or existing building will suffice, or that some make-shift arrangement can be extemporised when infectious disease has broken out. Such expedients, however, are rarely satisfactory. The cost of procuring and adapting a site, providing water supply and drainage, and procuring furniture and other necessary equipment greatly reduces the apparent advantage on the score of economy of a wooden or iron building over a permanent one; existing buildings erected for other purposes cannot readily be adapted to make satisfactory hospitals; and extemporised arrangements such as tents and huts, which have to be erected when an outbreak occurs, are frequently not ready until too late to be of much use.

As regards the disadvantages of a movable tent hospital, even when the tents are kept in stock ready for erection, the following remarks may be quoted from the annual report for 1909 of Dr. J. W. Cook, medical officer of health for the Tendring Rural District.

"The isolation hospital consists of two tents, containing four beds each, for patients, and a bell-tent for two nurses, with a large van fitted up as, and used as a kitchen, when the hospital is at work. At other times the van contains all the appurtenances of the hospital, so that it can be moved about from place to place as may be required; but there is, and must be, considerable loss of time in getting it erected and put to work. Land has to be procured and nurses obtained, besides the erection of the tents, and then only one disease can be treated at a time. I have often regretted that we had no proper permanent hospital, but never more so than during the scarlet fever epidemic of last year, for, had there been a hospital ready so that the first cases could have been moved and placed under proper isolation, I feel sure the outbreak would have been stopped in a very short time, and that the cases would have been few."

Dr. Cook recommends in preference a combination of districts for the provision of a central hospital.

It must, however, be admitted that the economical advantages which a combination of districts should secure have not always in practice been obtained. The chief reason appears to have been that a Board or Committee formed for one particular object, whether for the establishment of a hospital or for any other purpose, laudably desirous of carrying out its work in the most complete manner, is apt to consider the question of ways and means less carefully than a council which is directly elected by the ratepayers and which has to have regard to other current needs and to the resources of the district. This danger has to be guarded against; but it does not outweigh the clear advantages of combination in suitable cases.

CHAPTER IV.

Principles involved in the Isolation of Infectious Diseases.

The diseases intended to be received into isolation hospitals are those which spread from person to person. The diseases most frequently treated in such hospitals are scarlet fever, diphtheria and enteric fever; also small-pox, which is treated in separate hospitals. Typhus is now a rare disease, but when it occurs is eminently one requiring isolation and treatment in hospital. Other infectious diseases as measles, puerperal fever and erysipelas are occasionally treated in hospital, but rather in the interests of the individual patient, or for reasons of convenience, than for the purpose of isolation with a view to prevent the spread of the disease. Of late years it has been the practice to receive cases of pulmonary tuberculosis into isolation hospitals, especially at times when they contain few other cases, but here again rather with a view to the cure or benefit of the patient, or to educate him in habits of fresh air and proper methods of disposal of sputum, than with the direct object of checking the spread of the disease

by isolation. Moreover, it not unfrequently happens that a person is taken ill with symptoms raising suspicion of infectious disease, where the circumstances are such that it is desirable to remove the patient at once without waiting for the nature of the case to be completely established, and it may eventually turn out not to be an infectious one. In a certain number of cases patients whose illness is not an infectious one are sent to isolation hospitals under a mistaken diagnosis. In the Metropolitan Asylums Board hospitals it is found that about 10 per cent. of the cases received are not of the kind which they were sent in as being.

For the production of an infectious disease in the individual or for its spread in a community, three factors or classes of factor are necessary: —

1st, there must be the specific germ or contagium of the disease.

2nd, there must be a susceptibility to the infection on the part of the individual or of a considerable proportion of individuals.

3rd, there must be a means or channel by which the specific infection is conveyed to the susceptible person or persons.

1st.—The specific contagium of infectious diseases is believed to be in all cases a living organism. In some diseases, as diphtheria and enteric fever, this organism is known; in others, as measles and small-pox it is believed on grounds of analogy to be of the same nature, although the organism itself has not yet been identified, owing to its being too minute to be revealed by the microscope, or to no means having yet been discovered of making it visible by staining, or of cultivating it on media outside the body.

The symptoms of an infectious disease do not commence immediately on the reception of the contagium into the system, but a certain period of time is necessary to enable the organism to multiply and produce its toxic products. This period is called the period of incubation, and differs in different diseases, being short—2 to 5 days—in scarlet fever and diphtheria, and long—10 days to a fortnight or more—in measles, whooping cough, enteric fever, chicken-pox and small-pox. In mumps it is as long as 21 days. It is possible for the contagia of two different infectious diseases to be in the system at the same time, and hence a patient who has been admitted to hospital with a disease of short incubation period, as scarlet fever, may some days after his admission manifest a second disease of longer period, as measles or whooping cough. Again, the contagia of certain infectious diseases may be present for some time in the bodies of persons without producing obvious symptoms; *e.g.*, diphtheria bacilli may be present in the fauces of scarlet fever patients or of apparently healthy persons. In such ways it is possible for the contagium of a second infectious disease to gain access to a

hospital ward, and for cases of mixed nature to occur. There are also pathogenic organisms of less definite characteristics, such as the streptococci and staphylococci, which are capable of living and multiplying in dirt and organic media outside the human body, but are also capable, if they gain access through a breach of surface, of invading the tissues, producing suppuration and other septic conditions. Such organisms are liable to occur in association with those of the specific infectious diseases, and this association has a large share in the production of severe and complicated cases and of sequelae. Apart from such complications, however, the contagia of the specific infectious diseases are liable to vary in virulence from time to time; there may be a severe strain and a mild strain of the same disease; and such strains often breed true; thus a mild and a severe type of small-pox, of different origins, have been known to be prevalent in a town at the same time. The passage of a mild strain through a succession of individuals of a high degree of susceptibility may tend to increase its virulence, in the same way that in the laboratory the activity of a virus may be increased by passing it through a series of animals of a susceptible species, and this may be one factor in the causation of the high mortality which occurs when an infectious disease is newly introduced into a community in which it has previously been unknown.

There is reason also to think that the potency of a contagium is increased when a number of cases of the disease are closely aggregated together, and it has been suggested that there may be under such circumstances not only a concentration of the poison but also an enhanced activity in the strain of the infective organism analogous to the increased vigour conferred upon strains of plants and animals by cross-fertilisation.

> In his report of 1881 "On the influence of the Fulham Small-pox hospital on the neighbourhood surrounding it" (Supplement to 10th Annual Report of Local Government Board for 1880-81, pp. 331, 332), Mr. (now Sir W. H.) Power raised the question whether the difference between the Fulham hospital and the private houses of the district in their ability to distribute small-pox to neighbours was a mere matter of concentration and demonstrability (as a large fire would scorch at a greater distance and would be more seen and talked about than many small fires would be), or whether it consisted in an alteration in the quality of the small-pox material, an exalted faculty of reproducing its kind, attributable to the bringing together of many differing, while all actively endowed, varieties of the disease (in the same fashion that long-stamened and short-stamened primroses propagate better together than do primroses with flowers of the same form). He had the suspicion that the latter might be found the true solution.

Whether or not the close aggregation of a number of cases of the same disease enhances the activity of the specific contagium, it is obvious that it must increase the opportunity for cross-infection with other pathogenic and septic organisms which may chance to be present.

2nd.—When a number of persons are simultaneously exposed to the contagium of an infectious disease it is usually only a minority who contract it. Hence there must be in the human

body certain powers of resistance, varying in degree in different persons, and (assuming equal doses of infection) it is only those in which these powers of resistance are low who succumb. The question of dose is, however, an important one; a person whose powers of resistance will suffice to safeguard him against a single exposure to a dilute contagium, may succumb if the exposure be prolonged or the contagium be highly concentrated, as in the case of nurses in a hospital ward when overcrowded.

A protection, more or less complete and persistent, is conferred by a previous attack of the disease, and in the case of some diseases can be acquired by inoculation of a vaccine. On the other hand a lowering of the general health, as by fatigue or privation, weakens the powers of resistance, or a local lesion may afford a place of entry; thus persons, as already mentioned, may carry the diphtheria bacillus in their throats and yet remain in apparent health until they get a sore throat from some other cause, upon which diphtheria supervenes, the local lesion affording a surface suitable for the growth of the bacilli and for the absorption of their poisonous products. In this way one infectious disease or infective process is liable to prepare the way for another; thus scarlet fever is often complicated or followed by diphtheria; measles by whooping cough; and measles, whooping cough and influenza by pneumonia; while either of these diseases may by weakening the resistance of the body lay it open to invasion by tuberculosis, or bring latent tuberculosis into activity.

Age has much influence upon susceptibility to attack, older persons being less susceptible to most infectious diseases, even apart from the immunity which they are likely to have acquired by reason of a previous attack. Infants at the breast are believed to be comparatively little susceptible to infectious febrile diseases. The susceptibility to whooping cough and measles is greatest in the earlier years of the first quinquennium of life, being at its maximum about the second year; that of scarlet fever and diphtheria reaches its maximum rather later—at ages 3 to 5—though the case mortality is higher at earlier ages. Enteric fever, on the other hand, is more a disease of adolescence and early adult life, its prevalence being greatest at ages between 5 and 35, though the case mortality is greater at later ages.

3rd.—The mechanical channels through which infection may be conveyed from one person to another are numerous. They vary to some extent in the case of different diseases; thus, although the contagium of small-pox is transmissible through the air to a greater distance than that of any other disease, and long retains its virulence in fomites, it has never been known to be conveyed by water. The various channels may be spoken of under the following headings, though the classification is not exhaustive, nor can an exact line of demarcation be drawn between the several methods. They are arranged approximately in the order of "striking distance," *i.e.*, of the distance from the source of infection to which their influence may extend.

1. *Inoculation.*—Insertion of the contagium into the body through a breach of the surface is usually necessary in the case of vaccinia, anthrax, hydrophobia, and some septic affections.

2. *Contact,* as by kissing, &c. Certain diseases as diphtheria, venereal diseases, purulent ophthalmia, &c. are capable of being transmitted by contact with an unbroken mucous membrane.

3. *Parasites.*—The bites of blood-sucking insects as fleas, bugs, and lice may be a means of direct transmission from person to person of infectious diseases such as typhus and relapsing fever, as the rat flea conveys plague from the rat to man.

> In other diseases the living contagium is not capable of direct transmission but undergoes a transformation in the body of an intermediate host—as the malaria organism in that of the mosquito—this mode, however, need not be further considered here.

4. *Mediate infection.*—The contagium is carried in a fresh state from person to person more or less directly on some article which the patient has used or on the hands or clothing of the attendant. This is believed by Dr. Caiger to be the most frequent source of secondary infections in hospital wards where patients are confined to bed—*see* the section of this report on cubicle hospitals, p. 30 and seq.

5. *Droplet infection.*—In infectious diseases such as diphtheria, scarlet fever, measles, and whooping cough, accompanied by morbid processes about the mouth and respiratory passages, and also in pulmonary tuberculosis, particles of infected mucus from the mouth, nostrils or air passages of the patient are expelled into the air in the acts of coughing, sneezing, or speaking, and may reach directly another person standing or lying near.

6. *Fomites.*—Infectious matter from the patient may attach itself to articles with which he has come in contact, and may under favourable circumstances long retain its virulence. This is especially the case with small-pox, a disease of which many outbreaks have occurred among rag sorters at paper mills, due to infection retained in the rags. Anthrax spores retain their vitality in infected wools for many months. An article used by a scarlet fever patient has been known to retain its infectivity after having been kept shut up for a period of 12 months. In the case of other diseases, as measles, the contagium appears soon to lose its virulence.

7. *Aërial convection.*—Fine droplets of saliva or mucus expelled into the air in the acts of coughing, sneezing, or speaking may remain long suspended and be conveyed by currents, and bacteria from the mouth may as Dr. Mervyn Gordon has shown be carried for a distance of 71 feet in an enclosed chamber.* Dust and drain air may also convey infectious organisms. From cases of small-pox there appears to be an impalpable exhalation

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* Report on an investigation of the Ventilation of the Debating Chamber of the House of Commons. 1906. (Cd. 3068.)

which may be conveyed in an active state through the air for considerable distances.

8. *Food and drink.*—Infection from a distant source may be conveyed in articles of food or drink. Thus wide-spread outbreaks of enteric fever have had their origin in water supplies to which the specific contagium of the disease had obtained access, or in the eating of uncooked shellfish from contaminated layings. Milk is a favourable medium for the growth of pathogenic organisms, and many outbreaks of scarlet fever and diphtheria have been traced to infected milk supplies, often from distant sources. Many outbreaks of enteric fever have been attributed to food prepared by persons who were subsequently found to be "carriers," the *Bacillus typhosus* being found in their intestinal contents or urine.

By several of the above mentioned channels there should be no risk of the conveyance of infection from person to person at a well managed isolation hospital. Inoculation is hardly in question; bed parasites should not exist; and infected articles ought not to be put away without disinfection. The avoidance of cross infection by direct contact between patients is a matter of discipline, and of that by mediate infection of careful technique in nursing.

Avoidance of transference of contagium from patient to patient, whether by direct droplet infection or through the general air of the ward, is more a matter depending on the structural arrangement of the hospital and relative position of the beds. The chief points to be aimed at are that there should be aerial separation between patients with different diseases—its completeness depending upon the diffusibility of the contagium—that the distance of any bed from any other should be such as to avoid any direct transference of contagium from patient to patient, and that the ventilation of the ward should be adequate to dilute and disperse any atmospheric infection and to keep the air of the ward pure.

The degree of separation necessary varies in the case of different diseases. Thus enteric fever cases are often treated in the wards of a general hospital, and it is found that the disease very rarely spreads to patients in the neighbouring beds, although the nurses in attendance on the enteric fever patients not unfrequently contract it. In the cubicle wards at the South Western Hospital of the Metropolitan Asylums Board it is found that enclosure of the patient in a compartment with glass walls not reaching to the ceiling, together with careful nursing, will prevent the spread of infection to other patients from a case of diphtheria or whooping cough, but not from one of chicken-pox or of measles in the acute stage.

Small-pox cannot be safely treated in the same hospital with susceptible persons suffering from other diseases, even in different buildings.

It follows from what has been said in the preceding pages that in the treatment of persons suffering from infectious diseases, not only should the patients be isolated from healthy susceptible

persons (except such as are necessarily in attendance on them), and those suffering from different diseases be kept apart; but even the interchange of infection between persons suffering from the same disease should, as far as practicable, be avoided, especially in the acute stages, if not by a material barrier between the beds, at any rate by their being placed at a sufficient distance from one another to avoid direct transference of infection, by free ventilation and by careful nursing; thorough cleanliness of the patient's surroundings should be maintained and he should be placed generally under the conditions most suitable for his well-being, as his case may require. To secure these objects, accommodation for an adequate staff should be provided, and also sufficient means for washing and disinfection of soiled and infected articles.

CHAPTER V.

Design of Isolation Hospitals.

The principles by which the Local Government Board have been guided in cases where their approval of the construction of an isolation hospital is necessary are set forth in a memorandum "On the provision of Isolation Hospital Accommodation by Local Authorities" issued last in 1902, with an appendix in 1908.* Compliance with the Board's requirements as here set forth is, however, obligatory only when the hospital is to be erected by means of a loan sanctioned by the Board, or when for some other reason the Board's approval is needed. In other cases local authorities have under Section 131, Public Health Act, 1875, the power to "provide for the use of the inhabitants of their district hospitals or temporary places for the reception of the sick" without the approval of the Local Government Board or of any other Government department being needed; the responsibility for the suitable design, position and construction of such places resting solely upon the local authority themselves.

The selection of a suitable site for an isolation hospital is a matter of great importance, but the choice must depend so much on the local conditions and circumstances of each particular case, that it is not possible here to add anything to the general remarks on the subject in the Board's memorandum.

The memorandum of 1902 contains plans of wardblocks of two different types, viz.: Plan C in which two wards, for males and

* *See* Appendix A to this report. Another memorandum on "Isolation Hospitals" is issued by the Board for the guidance of Local Authorities in applying for sanction to loans for the provision of isolation hospitals; for the constitution of Joint Hospital Districts; and in proceedings under the Isolation Hospitals Acts, 1893 and 1901. This memorandum deals with matters of law and procedure, rather than with the arrangement and construction of isolation hospitals.

females respectively, each containing a number of beds, with a nurse's duty room between them, are placed in one pavilion, the two wards and duty-room being approached from a common entrance hall. In plan B on the other hand the wards contain only two beds each, with intervening duty room, and are separately entered from a verandah open to the air. In plan D in the appendix this principle is carried further, each ward being divided by a close glazed partition into two single bed compartments.

The purpose of these two forms of wardblock is different. The pavilion form, plan C, is that in which a number of patients of different sexes but suffering from the same disease can be most cheaply housed, and most conveniently attended to, but it does not afford facilities for classification of patients, except by sex, and in a block of this kind the admission of a single case of infectious disease will ordinarily render the whole of the remaining beds in the block unavailable except for cases of the same disease.

On the other hand, in a block on plan B, or D—often spoken of as an "observation" or "isolation" block—in which the wards are separately entered from the open air, cases of different diseases may, with proper precautions in nursing, be treated in the same block without serious risk of interchange of infection. Such a block lends itself to classification of patients in various ways, *e.g.*, for the segregation of a patient who develops a second infectious disease (mixed infection), or for the keeping under observation of a doubtful case. It may also be used instead of the larger pavilion block on the occasion of an outbreak of infectious disease comprising only a few cases, or for a few cases of a second disease, when the pavilion is already in use for one disease.* Hence although in blocks of this kind, the cost of construction per bed is somewhat higher and administration somewhat less convenient than in a block on the pavilion plan, the beds can be used under a greater variety of circumstances, and, as pointed out in the Board's memorandum, the same number of beds will go farther in blocks on the separate principle than in pavilions.

The plans in the hospital memorandum are intended as suggestions only, and it is open to local authorities to vary them in view of the requirements of their districts. But, except as regards the number of beds in the wardblocks, any deviation from the Board's plans which is not inconsistent with the principles set out in the memorandum usually involves additional expense per bed, and some of the cheapest hospitals have been those which have most nearly followed the Board's plans.

As regards plan C the following modifications may in particular cases be of advantage.

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* It is in view of usefulness for the latter purposes that in Plan B the wards have been designed with two beds each. In a block intended only for the purpose of separate isolation, single bed wards are preferable.

It is sometimes considered desirable to make the wards of unequal size, as indicated in the plan, with a different number of beds, on the ground that the young children of both sexes may occupy the same ward as adult females.

In large hospitals where several pavilions may be required for cases of a single disease, a pavilion may consist of a single large ward, with the duty room, &c., at one end, and this arrangement may be repeated on the first floor if the building is of two storeys. It is not generally advisable however that the number of beds in a ward should exceed 20.

To a pavilion block may be conveniently appended single-bed wards as shown in the plan C. These are useful for special cases of the same disease as that treated in the main wards, *e.g.*, for delirious or offensive patients, for cases requiring operation, or for private patients for whom separate accommodation is desired, but are not intended for cases of a different disease.

The space above the centre portion of a block on Plan C, may be utilised for a day room for convalescents. As the duty room and hall need not be more than 9 or 10 feet in height, while the wards are usually 13 feet high, such a room can be constructed at little extra cost, and has been found very useful as affording a place where the children can play without disturbing those who are still in the acute stage, and where they will be out of the infected air of the ward. On the latter ground it is better that the convalescent room should be approached by stairs from the open air under a porch.

At some hospitals, *e.g.*, at Huddersfield and at Kirkburton Joint hospital (*see* pp. 91 and 95 of this report) a room for convalescents has been provided by dividing off the further part of a long ward from the remainder, by means of a fixed or movable partition. Where this is done it is convenient that the annexe containing the sanitary conveniences should be placed at the side of the ward, instead of at the end, and should be approached through a lobby having a door on either side of the partition, so that access to the w.c.'s can be had from either the ward or the convalescent room without passing through the other apartment. See plan of Kirkburton Joint hospital.

Verandahs on the sunny side of the wards are useful for the purpose of open air treatment, and with this view should be of a width sufficient to enable beds to be placed in them. Access to the verandah from the ward may be obtained by a French window, or by sliding doors as at the Bagthorpe hospital, Nottingham (*see* p. 103). The verandah may have a dwarf wall, not more than 3 feet high, as a screen in front, but should be open between this and the roof. In order that it may not interfere with the light and ventilation of the wards the roof should be glazed, and should leave the uppermost portion of the ward windows free. The upper portion of the ward windows, about 24 inches in depth, is usually divided from the remainder by a transom, the part of

the window above this transom being made to open by means of a hopper light falling inwards with side cheeks to prevent down-draughts. The roof of the verandah should not extend higher than the transom.

The form of the block shown in plan B has undergone several modifications in successive issues of the memorandum. That shown in the 1902 issue was designed to obviate the objection sometimes raised to the earlier plan that it involved patients having to pass through the open air under the verandah in order to get to the w.c's. The two wards are, however, somewhat more directly connected with one another than is desirable if they are to be used for different diseases, and an arrangement by which they are approached from an open verandah, as in the Board's present plan D, may be substituted if desired. In any case the verandah in front of the nurse's duty room in the plan of 1902 should be left open in front. The verandahs in front of the wards in this plan are not essential and might be omitted if desired.

The size of the wards of a block of this kind is sometimes varied. With a view to afford more accommodation on the occasions when the block is used for cases of a single disease, the end wards are sometimes made large enough to contain three beds, as was shown in the Board's plan of 1888.

This, however, is of the nature of a compromise and is open to the objections that for the purpose of isolation of a mixed or doubtful case a three-bed ward is too large, as in the event of one bed being occupied by such a case two beds would be rendered unavailable for other cases, while on the other hand for the accommodation of a number of cases of one disease a four-bed ward in a block on plan C would probably cost no more to construct, and would be more convenient to administer than a three-bed ward in a block on plan B.

On the other hand when the block is intended for the purpose of isolation of individual patients rather than for the reception of many cases of one disease, the wards have sometimes been made only of a size to hold a single bed as was shown in the centre wards of the Board's plan B of 1888.

Single-bed wards facilitate classification of patients according to sex and disease, but accommodation consisting of such wards is more expensive in construction and less convenient of administration than where the beds are in larger wards; it has also sometimes been found that children feel lonely and afraid if left alone in a ward. The two latter objections are more or less obviated by making the partitions between the wards of glass as in the Board's present plan D, so that a view may be had from the nurse's duty room to all the wards and from one ward to another—of course only to those occupied by persons of the same sex. We thus get a block on what is called the cubicle system.

CHAPTER VI.

Compartment and Cubicle Blocks.*

The "Barrier" System.

The construction of a wardblock in such manner that each patient should be enclosed in a separate glass cell or compartment was suggested so long ago as 1871 by Mr. Henry Greenway, medical officer of health for Plymouth, whose plan is described and figured in the "British Medical Journal" of May 11th, 1872. It consisted of a double row of cells with glass sides and ceilings, placed back-to-back down the centre of a wardblock, so as to leave a corridor on either side and at each end between the cells and the outer walls and also a space above the cells under the roof. This arrangement was originally proposed for a surgical hospital; attention having at that time been forcibly directed by the writings of Sir James Young Simpson to the high mortality from septic affections after operations in hospitals as compared with that of similar cases treated in their own homes. But the success attained by the antiseptic methods introduced about the same time by Lord Lister obviated the need for any such method of construction for surgical hospitals, and I am not aware that any hospital was ever built on Mr. Greenway's plan.

In 1890-1 the Plymouth Town Council sought sanction to a loan for the erection of a fever hospital on a modification of this plan. The glass compartments were for two or four beds each, and were in a single row having windows into the open air on one side and opening into a corridor on the other side. This corridor was divided by doors, one between every two compartments, with the intention that different infectious diseases could be treated in the block at the same time, and more or fewer beds be allotted to each disease as occasion required. The plan was, however, not approved by the Local Government Board.

Hospital blocks on the compartment principle have, however, been in use in Paris for some 10-15 years at the Pasteur Institute hospital, and at the hospital for Sick Children, and are described in the appended minute by Dr. Theodore Thomson (*see* Appendix B).

At the former hospital the arrangement was adopted with the special object of enabling cases of different infectious diseases to be safely located in one building for the convenience of scientific study, but I understand that when small-pox cases are in the

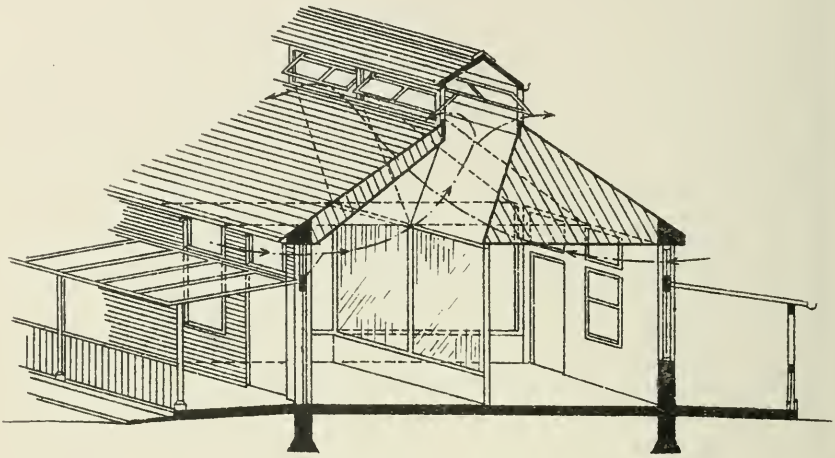
* The word "cubicle" is used in more than one sense. It is sometimes applied to any kind of single-bed compartment into which a large wardblock may be divided, even if completely separated from one another. By other writers it is restricted to those which are only partially divided from each other or from the rest of the ward by partitions not reaching the ceiling, in contradistinction to single-bed cells or "boxes" which are completely separate from each other. In this chapter the word cubicle is used by me for the sake of clearness in the latter or restricted sense.

COUNTY BOROUGH OF CROYDON.

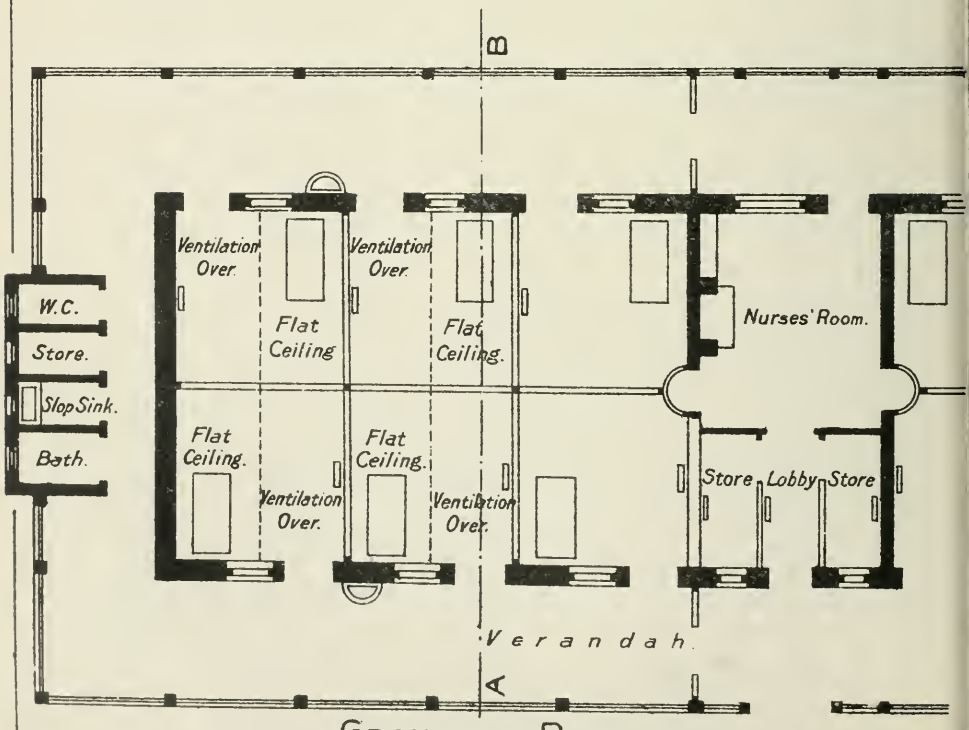
BOROUGH HOSPITAL, WADDON.

ISOLATION PAVILION.

SCALE OF FEET.



SECTION A-B.



GROUND PLAN.

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Maltby & Sons, Lith.

hospital, it is found necessary to vaccinate patients with other diseases who may be there at the same time. At the Sick Children's hospital the object was that of the separate isolation of mixed or doubtful cases of infectious disease, and the latter is also the chief object for which blocks on this principle have been constructed in England. At both of the Paris hospitals the blocks are of three storeys and on each floor the compartments or "boxes" are ranged along either side of a central corridor by which access to them is obtained, but at the Pasteur Institute hospital there is also access to each compartment from an outside verandah; and there are some other differences which are mentioned in Dr. Thomson's minute.

The first hospital block on the compartment plan erected in this country with the sanction of the Local Government Board was that at the Walthamstow hospital, described on pages 129-133 of this report. In this, which is a one-storey block, the central corridor is omitted, access being obtained from an open verandah only, and the compartments are placed back-to-back in a double row, cross ventilation being provided for by a special arrangement of underground air ducts. Similar blocks have since been erected at other isolation hospitals, as at Norwich, Enfield, and Croydon.

In the Croydon block cross ventilation of the compartments is provided for by a series of decussating air shafts at the top of the compartments instead of by underground ducts. One half of the top of each compartment forms a shaft which crosses obliquely over the adjoining compartment in the other row to open on the opposite side of the ridge of the roof as shown in the plan opposite:

In the Board's plan D in which the compartments are in a single row the difficulty as to cross ventilation does not occur, as windows are provided on both sides of each compartment, and the same advantage is afforded by a block designed by Mr. Chart which has been erected by the Croydon Rural District Council at their hospital at Beddington Corner. This block is of a cruciform shape, the duty room forming the centre and each wing containing three rooms separated by glass partitions, and opening on to a verandah, as in the Board's plan D. (*See* pages 76-77 of this report.)

At the East Ham Isolation hospital a block has been erected in which the compartments are approached from a central corridor as at the Paris hospitals, but the block is a single storey one, and the roof of the corridor is raised and furnished with louvres on either side and with openings at each end for the purpose of cross ventilation. (*See* pages 83-85 of this report.)

At the South Western hospital of the Metropolitan Asylums Board a somewhat different principle has been adopted. In a previously erected two storey block containing on each floor a large and a small ward, the large wards have been divided into a number of cubicles by glazed partitions not reaching to the ceiling, the cubicles being entered from a central passage, like high pews in a church or loose boxes in a stable. The arrangement is described in detail by Dr. Foord Caiger, medical superintendent, in a

paper read before the Society of Medical Officers of Health on April 7th, 1911, and published in "Public Health" for June, 1911, from which the following extract is taken:—

"Each of these two wards, which before conversion into cubicles contained 18 beds, is 100 feet in length and 28 feet broad. It is divided by glass partitions, framed in iron, with a white enamelled surface, reaching to a height of 7 feet above the floor level, into 16 cubicles.

"A central passage, 5 feet 6 inches wide, runs the whole length of the ward, intersected at its middle point by a transverse passage of the same width leading to the bath rooms and sanitary annexe, one on each side of the ward. A row of cubicles is placed on either side of the central passage, the doorways of which, however, are not placed immediately opposite each other, but are arranged on the 'hit and miss' principle.

"The cubicle doors are only 3 feet 6 inches in height, the upper portion of the door opening being entirely unenclosed. These stable doors are double hung and fitted with spring hinges to enable them to swing in either direction. They readily open with the pressure of the toe or knee, thereby obviating the necessity of the nurse handling them in passing through, and she thus has both hands free for carrying things in and out of the cubicles.

"The proportion of floor space per bed is 175 square feet, and of this about 120 square feet are enclosed within the cubicle. The height of the ward being 14 feet, the total cubic space is 2,450 feet per bed—or 2,100 cubic feet, reckoned on the 12-foot basis.

"The ward is ventilated as a whole by means of large-winged fanlights over the windows, and the partitions are so disposed as to provide each cubicle with a separate window. Under every window is a fresh-air inlet, opening behind a double row of low-pressure hot-water pipes running round the ward. Additional warming is provided by means of four open fireplaces in the centre of the ward.

"Each cubicle is furnished with a fixed lavatory basin, the waste pipe from which is carried through the wall, and discharges over an open gully in the airing court. Over it is fixed a tepid spray, worked by a pedal action.

"The only furniture allowed in the cubicle in addition to the bed or cot is a bed locker and a bent-wood arm-chair. The locker is made of enamelled iron, and has a plate-glass top and one shelf of the same material.

"Separate linen overalls are provided in each of the cubicles. These are hung on movable brass hooks, and are worn by the medical officer and nurse when attending to that particular patient, while a sterilised towel, hung in proximity to the spray, affords a convenient opportunity for the ablution and drying of the hands immediately before leaving the cubicle.

"The bath room attached to each of the wards is furnished with a portable enamelled iron bath, which can easily be run into the cubicles, if desired, and a gas-heated copper steriliser, provided with a hot-water supply and a fixed waste, provides facilities for sterilising every article which has been used for the patient's treatment.

"On the side of the ward opposite to the bath room is the lavatory annexe, containing a w.c., bed-pan flush, and a scalding sink for the efficient cleansing of utensils.

"In the scullery serving the ward is a second steriliser of larger size for the disinfection of plates, cups, mugs, tumblers, knives, forks and spoons, &c., when removed from the cubicles after use by any of the patients.

"Attached to each of the wards, and opening into the ward-lobby, is a 'separation' room, containing two beds. It is provided with a separate w.c., slop sink and lavatory basins for the use of the patients occupying it."

There are thus, it will be seen, three different systems varying in the degree of aerial separation between the several compartments.

1st.—Each compartment is completely separated from any other, and is separately entered from the open air under a verandah, as at the Walthamstow hospital, and in the Board's plan D.

2nd.—Each compartment is separated from any other by a partition reaching to the ceiling, but the compartments are all entered from one corridor, as in the Paris hospitals, and at East Ham.

3rd.—The compartments or cubicles are all entered from one corridor and are separated from one another only by partitions not reaching to the ceiling, as at the South Western hospital.

(A still further reduction is the "barrier system," in which, however, the beds are not actually separated from one another by any physical barrier; the so-called "barrier" being merely a coloured cord at the foot of the bed to indicate the necessity for special aseptic precaution—*see* page 37.)

Whatever the form of the compartments or cubicles, "aseptic nursing" is an essential feature of the system. A separate overall is kept hung up at each compartment, which the nurse puts on before attending to the patient and takes off on leaving the compartment. Between attending to one patient and another she washes her hands in a lavatory basin provided in a convenient situation. Separate instruments and utensils are provided for each patient and are sterilised after use. The regulations in force at the South Western hospital are set out in detail by Dr. Caiger in the paper already quoted, as follows:—

"(1.) During the busy hours, when the washing of patients and the treatment is being carried out, the nurses are to wear no cuffs, and are to keep their sleeves turned up.

"(2.) The overall is to be put on immediately on entering the cubicle, if the patient, his clothing, or the bedding requires to be touched. The overall is to be taken off and hung on the hook before leaving the cubicle. The only occasion on which the nurse may leave the cubicle wearing the overall is when she takes the patient to the bath room, or to the closet, if he be getting up; or when carrying an utensil to the closet after use by the patient, if he be in bed. The overall belonging to one cubicle is never to be worn by the nurse when entering another one.

"(3.) When the nurse has finished attending to the patient the hands are to be well rinsed under the spray *immediately before* leaving the cubicle, and *after* removing the overall.

"(4.) Each cubicle is equipped with a bath blanket, bath towel, hand towel, hair brush, comb, small-tooth comb, soap and flannel; and also with a tongue spatula, throat syringe and ear syringe, all of which are kept in the enamelled iron bed locker and reserved for that patient's sole use. After the doctor has made his round, all spatulas, nozzles, porringers and medicine glasses which have been used are to be collected and removed to the bath room for sterilisation; afterwards they are to be taken back to the cubicles.

"(5.) The same procedure is to be observed in the case of plates, cups, saucers, knives, forks and spoons, which, after use by patients, are to be collected and taken to the ward scullery to be washed up and sterilised. No article is to be put back on the dresser for future use until after it has been through the steriliser.

"(6.) In the serving of meals the nurse is to first go round and prepare each patient, by sitting him up in bed, putting on the bib, &c.,

so that he may be ready to take the food when brought to him. In doing this she is to put on the overall and rinse her hands in every case. When subsequently handing him his food simply, as also when handing him any other article from outside the cubicle, such as a book, letter or toy, the nurse is not required to put on the overall or to rinse her hands unless it is necessary for her to touch the patient or the bed-clothes.

"(7.) When *bathing patients in the bath room* each patient is to be taken there separately wrapped in his bath blanket, together with his bath towel. After bathing the patient is to be taken to the cubicle, wrapped as before in his bath blanket. The water is then run out of the bath, and the inside well rinsed out and afterwards sponged over with a solution of 1 in 20 carbolic acid before another patient is brought into the room for bathing.

"(8.) When a patient who is getting up *goes to the water closet* the same precautions are to be observed. No two patients are to be allowed to meet in their passage to and from the closets. As in the case of the bath room, each patient is to be personally conducted there and back again. After use by any patient the seat of the water closet is to be wiped over with a cloth wrung out in 1 in 20 carbolic lotion, and the closet freely ventilated by opening the window as soon as it has been vacated."

He adds:

"In view of the importance we attach to the careful observance of these regulations by the nurses, the reasons underlying them are explained to each nurse at the time she is put to work in the cubicle wards, and it is also impressed upon her that it is on her conscientious attention to the details above enumerated that the success or failure of the treatment will depend. In this way her intelligent interest is enlisted, and her loyal co-operation in the work is likely to be secured. Very careful supervision is exercised by the sister in charge of the ward, and any laxity observed on the part of her subordinates in respect to the technique is severely dealt with."

The procedure at the Walthamstow hospital is similar, but differs slightly in details—*see* pages 130 and 131 of this report. The overalls are hung up in the verandah instead of in the compartments, and the lavatory basins are also in the verandah instead of in the compartments, and they are provided with self-closing push-taps which are less expensive than the pedal taps in use at the South Western hospital. As the nurse washes her hands with disinfecting soap in the basin, after filling with water, and does not need to touch the taps again, the pedal action is not necessary as it is where she merely rinses her hands in the running spray.

As regards the comparative merit of the three arrangements mentioned above, the preference will depend upon the view which we take of the mechanism by which infection is spread. If it can be conveyed in dust or droplets through the air for more than a very few feet (aerial convection) the more complete aerial separation obtained by the first arrangement is to be preferred; if it is conveyed attached to solid substances, such as the hands or clothing of the nurse, or the instruments and utensils which have been in contact with the patient (mediate infection) the less complete aerial separation afforded by the 3rd system may suffice. Apart from the case of small-pox, the trend of medical opinion at the present time seems to be in favour of mediate infection rather than aerial convection as the more usual method of propagation of disease, though as already pointed out on page 25 there is a difference between different diseases as regards their "striking distance."

As the result of his four years' continuous observation at the South Western hospital, and from the inference based on general experience, Dr. Caiger is of opinion that partially separated cubicles, as opposed to self-contained rooms, are unsuited for the treatment of small-pox and chicken-pox, and of measles during the acute stage of the illness, and there is apparently some risk in the case of septic scarlet fever. On the other hand, scarlet fever, if not of a septic type, diphtheria, measles in the post-eruptive stage, rubella, whooping cough, mumps, influenza, enteric and probably typhus fever, can be treated without much fear of accident. Success or failure in these diseases is mainly a question of "aseptic" nursing.

It is claimed on behalf of the central corridor arrangement that the nursing is less laborious and less trying than when the compartments have to be approached from an open corridor exposed to the inclemencies of the weather. I was informed, however, at the Walthamstow and Croydon Rural hospitals that no complaint was made on this score by the nurses there, and the experience at the Bagthorpe hospital, Nottingham, where similar exposure to the weather is involved in the open air treatment as carried out there appears to be to the same effect—*see* page 104. On the other hand, at East Ham complaints were made of the draughtiness of the central corridor.

The following report by Dr. Gellatly, resident medical officer of the Walthamstow Isolation hospital, is taken from the annual report of the medical officer of health for that district for 1909.

"*Cubicle ('G') Block.**

"The cubicle block continues to be of the very greatest value in securing thoroughly efficient and economical isolation of mixed and doubtful cases.

"During the past year 132 patients (*i.e.*, 25 per cent. of the cases admitted) were treated wholly or in part in this block of 12 beds.

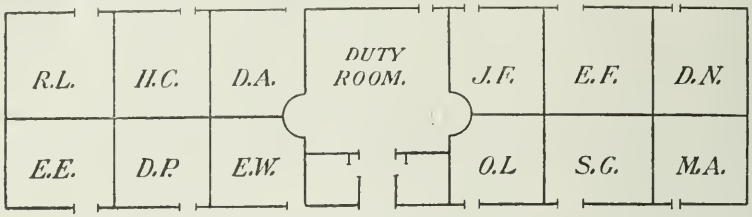
"It is unfortunately not possible to give statistics relating to the results of treatment in the cubicles as compared with the general wards, nor to give any idea of the possible effect of separate isolation on the number of return cases. There is, as a rule, such a demand in the accommodation in this block that septic and doubtful cases have to be moved to the convalescent wards as soon as possible, so that only part of their time is spent in the cubicles, and they are, therefore, almost useless for the purpose of comparison.

"In spite of the varied nature of the cases, and the high infectivity of some of the diseases treated—such as chicken-pox and mumps—no case of infection being carried from one cubicle to another has occurred.

"From the following diagram the cases actually in the cubicles on June 20th, 1909, are shown, and the possibilities of such a ward may be appreciated.

* It is to be noted that what are called "cubicles" in this report are rooms completely divided from one another by glass partitions, and entered separately from the open air, not portions of a large ward incompletely partitioned off like the "cubicles" at the South Western Hospital described above by Dr. Caiger.

"It is taken at random from a number of such records, and was not specially chosen in any way, except that it was made when the cubicles were all occupied.



R. L.—Admitted as diphtheria; symptoms suggest scarlet fever only.
H. C.—Is suffering from diphtheria, but has shown some desquamation very suggestive of scarlet fever also.
D. A.—Admitted as diphtheria; proved to be suffering from scarlet fever only; very septic.
J. F.—Scarlet fever; symptoms on admission were suggestive of measles.
E. F.—Scarlet fever; septic; has purulent conjunctivitis.
D. N.—Scarlet fever + diphtheria.
E. E.—Diphtheria, but was convalescent from whooping cough on admission.
D. P.—Scarlet fever; complicated acute nephritis.
E. W.—Scarlet fever; complicated acute nephritis.
O. L.—Scarlet fever + diphtheria.
S. G.—Admitted as scarlet fever; two days after admission developed measles rash.
M. A.—Scarlet fever; other members of family have measles at present.

"Of the 132 patients treated in the cubicles 18 showed no definite signs of any infectious disease during their stay in the hospital; 20 were cases of scarlet fever, which had no definite signs or symptoms on admission, but later showed typical desquamation; 9 were cases of scarlet fever and diphtheria; 26 were removed to 'G,' after admission, on account of suspicious symptoms. The majority of these were patients admitted as diphtheria, who proved to have no diphtheria bacilli present, and whose other symptoms suggested that they might have had a slight attack of scarlet fever; 12 were cases of acute nephritis complicating scarlet fever. These are found to make very satisfactory progress in the cubicles, owing probably to the warm equable temperature it is possible to maintain there.

"These few particulars may perhaps serve to illustrate what an important part this block plays in the administration of the hospital. It should also be taken into consideration that each cubicle can be thoroughly disinfected without any delay and without any inconvenience to any other patients in the block, and that it is not necessary to provide any sick room accommodation for the staff, as any illness, infectious or otherwise, can be satisfactorily dealt with in a cubicle."

The advantages claimed for the glass compartment system are that with proper nursing precautions it enables patients with different diseases to be treated in one block without risk of cross infection; that the cost of erection is less per bed than that of a block with small separate wards of the usual kind; that every one of the beds can be used at any time irrespective of how any other beds may be occupied; and that the glass partitions facilitate supervision and promote the contentment of the patients, who feel less lonely when they can see others than

in separate wards. It would not be proper, however, on grounds of decency, to place adult patients of different sexes in compartments separated only from one another by a glass partition.

The disadvantages of the compartment or cubicle system as compared with a pavilion of the ordinary kind (plan C.) are that the capital cost per bed is greater; that more nurses are required for the same number of patients; and that the nurses must be of a high standard of discipline and assiduity. Hence a block on this system is not to be recommended as the sole provision in a small hospital, in which the nursing staff is often reduced to a minimum at times when the hospital is empty and fresh nurses are engaged from time to time, as current needs require.

The Barrier System.—In this place the so-called "barrier system" of bed isolation in hospital may be described. The "barrier" it should be explained is not a tangible physical barrier between the beds, but a stringent system of aseptic nursing applied to special cases in a large ward which may be occupied by other patients who are attended by the same nurses. At the Plaistow hospital the cases thus treated are distinguished by a coloured cord between two uprights at the foot of the bed. In the cases thus indicated the nursing is carried out on lines similar to those adopted in the cubicle wards at the South Western hospital. The nursing appliances and personal articles required by the patient are kept on a shelf and in a locker by his bed for his sole use, and are sterilised after each time of using. The nurse is not allowed to enter the "barriered" space without putting on an overall kept there for her use while attending to the particular patient, and she rinses her hands in a disinfecting solution on each occasion after touching the patient or his surroundings.

The main principle is to block every channel of cross infection. The ambulance nurse when fetching a patient makes full enquiries as to any infection to which he may have been exposed other than that of the disease from which he has been notified as suffering, and as to any diseases from which he may previously have suffered; and the medical superintendent has power to refuse to take in patients whom he cannot isolate with safety to those already under his care. Each case is examined in the ambulance by a resident medical officer previous to admission to the wards, and upon this examination and the history obtained by the ambulance nurse the patients admitted fall into three groups, viz.: (*a*) those with regular infections which can be placed in a large ward without any special precautions; (*b*) those which can be "barriered" in a large ward; and (*c*) those which must go to a separation ward.

The following diseases, occurring as additional infections in cases, say, of scarlet fever, can, in Dr. Biernacki's opinion, be treated on the barrier system with safety to other patients in the same ward, viz.: typhoid fever, whooping cough, mumps, diphtheria, rubella, erysipelas, contagious affections of the eye and vagina, septic skin affections, and verminous conditions. Every case having a definite acute septic element is barriered. Scabies, owing to the stigma popularly attached to it, is treated in a separation ward. Chicken-pox and measles occurring as second infections cannot be safely treated in a large ward

with other patients even if "barriered," and are removed to separation wards. With scarlet fever as a second infection the barrier system cannot be depended on; it may prove successful, but may break down. Ringworm occurring in a scarlet fever ward should be removed to a separation ward; scarlet fever patients in Dr. Biernacki's experience being extremely susceptible to ringworm, owing presumably to the desquamation.

The principle of barrier work, according to Dr. Biernacki, is to carry on prevention in three zones, one beyond the other. These zones are (*a*) at the source, viz., the point at which the virus is escaping from the body; (*b*) in the immediate neighbourhood of the patient, practically represented by the bed; and (*c*) in the ward at large. Of these, control at the source is to be aimed at, but the common infectious diseases vary greatly as regards the extent to which source-control can be made effective, and in most of them source-control is only partial, so that preventive measures have to be applied in later stages to prevent dispersal of the virus. The means of control of infection at the source are classified as "continuous," *e.g.*, the catching of infectious discharges from the nose, eyes, or ears in pads of boracic wool; and "intermittent," *e.g.*, the periodical washing or spraying of those cavities with a disinfectant solution. (For details as to the various methods of nursing, I may refer to a series of articles by Dr. Biernacki on "Modern Fever Nursing" in the "Nursing Times" in 1908.)

It will be seen that Dr. Biernacki's experience with "barrier" nursing is similar to Dr. Caiger's with the partially separated cubicles at the South Western hospital, viz., that these methods suffice to prevent cross infection in the case of diseases of short "striking distance" in which transmission is chiefly by mediate infection; but that they fail in those in which the infection is more diffusible and can be conveyed by aërial convection as chicken-pox, measles, and in less degree scarlet fever. Dr. Biernacki says that even in the case of other diseases, although most of the patients in fever hospitals are young children who cannot project infective material by coughing or sneezing so far as adults, he should be sorry to rely on the barrier where the beds or cots were less than 12 feet apart. At the Plaistow hospital they are usually 15 feet apart, and when a case of whooping cough is under treatment a screen is used between the patient's bed and adjacent ones.

The advantages claimed for the barrier system over the partial cubicle system are the avoidance of cost of partitions, its greater flexibility, as the system need not be applied to all the beds in the ward, but more or fewer may be "barriered" at any time as circumstances require, also greater facility in nursing. It affords, however, less complete isolation than the separate cell system and is not adapted for all classes of cases.*

CHAPTER VII.

Details of Construction of Isolation Hospitals.

The following are points of detail in connection with the construction of the wardblocks of isolation hospitals:—

Walls.—Except in the case of temporary timber-framed buildings (for which loans have only been sanctioned in exceptional

* *See* footnote on page 135.

circumstances) the walls of isolation hospitals have been constructed of brick, or in districts where stone is more plentiful, of stone. Brick walls of wardblocks are generally made 14 inches (a brick and a half) thick, that thickness being regarded as necessary to secure stability in the case of a wall of the length and height usual in such a block; also to secure protection against penetration of damp and extremes of temperature. For the latter purposes, the walls may advantageously be built with an internal cavity.

It has been suggested that for the sake of cheapness the walls of hospital buildings might be constructed, in lieu of brick or stone, of the more recently introduced materials such as concrete, concrete blocks, Frazzi, &c. The Local Government Board have in one instance (at Acton—*see* p. 69) sanctioned a loan for the construction of a wardblock built of blocks of clinker concrete, keyed together in cement mortar and rendered outside with a coat $\frac{3}{4}''$ thick of cement and sand; the structure being supported by steel stanchions 12 feet apart which carry the roof. The cost of the walls was 5*s.* 10*d.* per superficial yard complete, and the total cost of the block for 36 beds, including roads and drains, but not furnishing, was £4,000 or £111 per bed. The cost per cubic foot was 4·66*d.* that of the original pavilions, which have hollow walls of brick having been 6·9*d.* per cubic foot. But the comparison is not quite fair as the new block is much longer, the main wards containing 18 and 16 beds respectively, whereas those in the older blocks contain only 6 and 8, and, the centre and ends of the block being nearly similar in each case, increased length of the wards does not add to the cost of the block proportionately to the increased number of beds.

The walls of hospital wards should be lined internally with some hard smooth impermeable material capable of being readily cleansed. There are various hard cements and plasters suitable for the purpose, and there are materials in sheets and slabs which can be fixed to the surface. A dado of enamelled or salt-glazed bricks is sometimes used, but adds to the cost.

Where it is desired to keep the cost at a minimum, as in the case of a small-pox hospital, rarely used, a smooth limewashed surface, easily renewable after each occasion of use, might suffice.

Timber-framed buildings are commonly lined internally with varnished match-boarding, but this, though warm and cheerful-looking when new, is open to serious objections, viz., its ready combustibility and the numerous crevices it affords, especially if the wood has shrunken, in which dust or vermin may lodge, and which render thorough disinfection difficult.

The angles between the floor and the walls of a hospital ward should be rounded off, as by a concave moulding or wooden fillet, in order to avoid any corner in which dust or dirt may lodge. For the same reason the vertical angles between walls should be rounded, and in the woodwork and plastering all projections and hollows which may harbour dust should be avoided, and the mouldings should be as simple and plain as possible. Facility of cleansing and saving of labour should be aimed at; thus unnecessary bright metal fittings which involve labour in polishing should be avoided.

The surface of the ground beneath a hospital ward should be covered with a layer of concrete or asphalte, and if there is a space under the floor it should be ventilated by air-bricks. In some cases hospital wards have been built on arches, but this adds greatly to the cost and has been found to render the wards cold, and, unless needed on very damp sites, is not to be recommended.

The floor of a hospital ward presents a somewhat difficult problem, and at many of the hospitals seen by me in the course of this inquiry the floors could not be considered altogether satisfactory. The desiderata of a ward floor are that it should be strong and durable, and not liable to crack; that it should be smooth, impermeable, and readily cleansed, but at the same time not too hard and cold to the feet, and that it should not be too costly.

Solid floors laid down *in situ*, such as cement, terrazzo, papyrolith, asbolith, dolomenl, &c., are impermeable so long as they are in sound condition, but they are liable to crack through settlement of the ground or through shrinking such as occurs in the neighbourhood of a stove or over hot water pipes. Materials containing sawdust are liable to get rough with wear. A hard floor, such as cement or terrazzo, is sometimes complained of as tiring to the nurses' feet or cold to those of the patients.

The objections to wooden floors arise chiefly through the shrinking of the wood, owing to its not having been thoroughly seasoned. A wood block floor laid on a concrete bed is satisfactory so long as it is in good condition, but the blocks are apt to work loose. A well-laid oak, pitch pine or teak floor, treated with beeswax and turpentine, "Ronuk," or melted paraffin wax, is durable, impervious, and readily cleaned, but is expensive; its slipperiness is also an objection. In several hospitals which I have seen in Yorkshire the floors were of maple boards in narrow widths, but these were not generally in a satisfactory condition owing to shrinking of the wood and the formation of crevices between the boards.

I am inclined to think that on economical and other grounds an ordinary boarded floor covered with linoleum or other similar impervious floor-cloth would be quite suitable. The floor-cloth should be of good quality and thickness, and in large pieces with as few joints as possible, the edges of the pieces being carefully fitted together and fastened down. At the East Ham hospital floor-cloth was in serviceable condition after 9 years' wear, *see* p. 82.

The usual height of wards is 13 feet, but the Board have allowed a less height in the case of cubicles and single-bed wards where a height of 13 feet would exceed the other dimensions of the wards.

In some Worcestershire hospitals designed by Mr. Hare, the upper part of the wards is in the roof, the walls being only 10 feet high, except at the windows, which are in small gables. A saving in the thickness of the walls may thus be effected.

The windows of a ward should have an aggregate area, including frames, of about 1 square foot to 70 cubic feet of internal capacity of the ward, or to between 5 and 6 square feet of floor area. If the window area falls much short of this proportion

it tends to make the wards look dark and gloomy; if it is much in excess the wards are more difficult to keep warm, with the result that the ventilation is apt to be restricted.

The sill of the windows, except in the case of French windows giving access to a verandah, should be about 3 feet 6 inches above the level of the floor, and the top of the windows not more than a foot below the level of the ceiling. Sash windows are the most suitable for hospital purposes; they are often made with a board at the bottom to exclude direct draught when the lower sash is slightly raised, thus allowing air to enter in an upward direction between the upper and lower sashes.* The upper part of the window, as already mentioned, should be furnished with a hopper light falling inwards, and having side cheeks to prevent direct draught.

Natural ventilation has been relied on in all the hospitals which I have seen. In addition to the windows, inlets under the beds, or Tobin's tubes, are often provided and sometimes extracting shafts and cowls in the roof. Ventilating stoves admitting warmed fresh air are often used. An extraction shaft may be placed surrounding the stove pipe or adjoining a chimney flue.

The warming of hospital wards is a matter requiring careful consideration; the means of warming originally provided having in many instances proved insufficient. Ample means of warming are necessary where the hospital is in an elevated and exposed position or the walls are thin, and where the wards have much outside wall in proportion to their capacity, or a large area of glass.

It is right, however, to add that by some hospital physicians the warming of hospital wards is considered a matter of minor importance as compared with an abundant supply of fresh air. It is maintained that patients, even with acute diseases, may advantageously be treated as nearly as possible in the open air, with merely the protection in severe weather of a verandah or shelter open in front, or in wards with the windows widely open; and that a low external temperature is of no consequence if the patient is kept warm by a sufficiency of clothing, with the aid if necessary of hot bottles. This is the generally accepted method of treatment of cases of pulmonary tuberculosis, and it has been in a measure adopted in the case of the acute infectious diseases as at Nottingham, *see* the account of the Bagthorpe hospital in a later part of this report (p. 101). It has not, however, I think, been proved that for all classes of cases, the maintenance of the air of the wards at a reasonably comfortable and equable temperature is a matter which can be safely regarded as unimportant.

In small wards, such as those in the Board's plan B, an ordinary fireplace is sufficient, but in larger wards such as those in plan C, the question will arise of the relative advantages of heating by stoves, or by a system of hot water or steam pipes, and in the case of a pipe system, whether the heating should be from a central boiler or from a separate boiler for each wardblock.

* In the "Anstral" system which has been adopted at the Altrincham Isolation Hospital the window below the transom consists of two frames, balanced together, which turn on horizontal pivots, and can be inclined at any desired angle.

The answer to these questions will depend in a measure upon the arrangements and use of the hospital and on the amount of heating required. If the buildings are compactly arranged the heating can be effected with a less expenditure of fuel and labour from a central boiler than from a number of fireplaces, especially if the elevation of temperature to be effected is a relatively large one, as on a cold site. On the other hand, if the ward blocks are small and scattered or if the hospital is only rarely in full use, as in the case of a small-pox hospital, the saving in current expenditure effected by heating from a central boiler may not counter-balance the interest on the capital cost of a central heating system. But even when wardblocks are not in use they require to be " aired " from time to time in order to keep them dry and fit for occupation, and a central heating system is found, as at Stroud, to be very useful for this purpose, and also to prevent freezing and bursting of pipes in times of frost.

There are, however, hygienic objections to the use of a hot water system as the sole means of warming wards. It lacks the cheerfulness of a fire-place, and unlike the latter does nothing directly to promote ventilation. Moreover, with a hot water system the heating is effected in a different way, and one less agreeable to the sensations of the occupants, than with fireplaces. The heating from an open fireplace takes place chiefly by radiation; the heat rays from the fire pass through the air without heating it directly, but warm the walls and solid substances upon which they impinge, and the air is warmed indirectly by contact with these; hence the walls, floor, and furniture, &c. are warmer than the air. On the other hand, with a low pressure hot water system the ward is heated chiefly by convection; the layer of air next the pipes gets warmed and rises, and its place is taken by a new volume of air which is warmed in its turn; thus the air of the ward is warmed more than the walls, floor, or furniture. But when warm air impinges upon a cold surface any solid particles suspended in the air become deposited upon the colder body, and hence in rooms heated by warm air the surfaces of walls and furniture tend to get covered with dust and dirt sooner than in one heated by radiant heat from stoves. Proximity to the colder surfaces also gives a sensation of chilliness, owing to loss of heat from the skin by radiation.

Again when air is heated its capacity for moisture is increased, and hence with a system of warming which heats the air by convection rather than the walls by radiation, the air having its degree of saturation lowered is liable to become unpleasantly dry.

Methods of heating by pipes at a higher temperature, as by steam or hot water under high pressure, give off more heat in the radiant form than low pressure hot water, but are liable to be accompanied by an unpleasant smell from heated organic matter in dust, hot varnish, &c.

But while there are objections to a system of heating by pipes as the sole means of warming wards, such a system may be usefully employed in addition to fireplaces in large wards, or where for reasons such as have been mentioned, ample means of

heating are required. In such a case the number of fireplaces may be reduced, a single fireplace, or in long wards, one in each end wall may suffice for the purposes of cheerfulness, ventilation, and affording radiant heat, and a central stove may be dispensed with.

Central stoves, however, have a cheerful appearance and are used in many hospitals. For large wards they are made with double fronts, so that one or both fireplaces may be used according to the requirements of the weather. They are often made, as in Shorland's and Musgrave's stoves, with descending flues which pass under the floor to a chimney at the side of the ward. This arrangement, as compared with a central upright flue, has the advantage that there is no obstruction to the view across the ward, but it is more costly and apt to go wrong. At many hospitals which I have visited at which stoves with descending flues were in use, there were complaints that in certain states of the weather smoke from them issued into the wards. In order to avoid this smoking the effective height of the chimney above the level of the fireplace should be at least twice the length of the horizontal portion of the flue, but this involves a tall chimney in a side wall. Another objection to a flue under the floor has been already mentioned, viz., that the heat from it is liable to cause shrinking and cracking of the floor. Upright flues for stoves are now made of pottery, which are less unsightly than an iron pipe or brick stack, and afford little obstruction to the view across the wards. In the lower wards of two-storey buildings, stoves with descending flues are preferable, and generally act well, a high chimney being obtainable.

The warming of wards of temporary hospitals is usually effected by means of stoves with iron flues. These are a great source of danger of fire, particularly at the points where the flues pass through the woodwork of the roof or walls. The danger is greatest in cold weather, when in order to maintain the temperature in the wards—often a matter of difficulty in such structures—large fires are kept up, with the result that the iron pipe gets overheated.

Hot Water Supply.—The supply of hot water for baths is a matter in which many hospitals have been found to be insufficiently provided, especially on occasions when there have been more patients in the wards than they were designed to accommodate. In small blocks hot water is usually obtained from a cylinder, the water being heated by a boiler connected with the fireplace in the nurses' duty room; but such a cylinder will not afford a supply sufficient for many baths at a time. Where gas is available a geyser may be used for furnishing a supply of hot water, as at the Bridport hospital (p. 72), but the danger of the use of such an apparatus without a flue to carry off the poisonous products of combustion should be borne in mind.

Where there is a supply of steam from a central boiler, a calorifier, heated by steam, may be used for the supply of hot water to baths; or in other cases a special boiler may be provided for the purpose. The drawing off of hot water from the circulating pipes used for warming is not advisable.

Bath-rooms.—One bath-room may conveniently serve for a wardblock of some 12 beds, sometimes even 16, and in such a block it is usually placed in the centre portion of the block, so as to be near to both wards and to the duty room from which the supply of hot water is obtained. Where the number of beds in a ward exceeds 12 it is desirable that it should have a separate bath-room approached direct from the ward; and this may be either in the centre of the block or in an annexe at the end, as shown in the plans of the Colne and Holme Joint hospital (p. 75) or at the side.

Movable baths were recommended in Sir R. Thorne's report on the ground of convenience of use for purposes of treatment at the patient's bedside, and also in order that one bath might serve for several small wards; but at the hospitals which I have visited where movable baths have been provided, I have found that they have rarely been used as such. The use of baths in the acute stage of fevers as a means of reducing hyperpyrexia appears to be less frequent now than in Sir R. Thorne's time, and in the case of convalescents nurses find the labour of wheeling to the ward a bath full of water, with the risk of its slopping over, greater than that of taking a patient to the bath-room.

For convenience in use and economy of hot water the baths should not be too deep and should have sloping sides and rounded bottom. For the use of children additional small baths requiring less water may advantageously be provided, and these should be fixed on a raised base, or if movable, on legs, so as to involve less stooping for the nurses.

Closets.—The water carriage system of excrement disposal should, if possible, be always used in connection with isolation hospitals; earth closets are not found satisfactory owing to the large amount of liquid which finds its way into them, the labour which their use entails upon the nurses, and the difficulty of providing a supply of suitable earth and of disposing of the contents. Sometimes sawdust impregnated with a disinfectant has been used in place of dry earth, and after use burnt in a furnace with the view of obviating the supposed danger of spread of infection of small-pox or enteric fever if infected excreta entered the sewers. There is, however, no evidence that these diseases can be thus spread if the contents of the sewers are properly disposed of, and even if the danger existed it would not attach solely to the fæces, but also to the passage into the sewers of infected liquids as urine and washing water. Sterilising tanks for sterilising the hospital sewage in bulk by steam or chemical disinfectants have in some instances been constructed, but their use in the cases of which I have knowledge has in course of time been in practice abandoned.

The water closets should be placed in annexes separated from the wards by cross-ventilated lobbies. The usual position of the annexe is at the end of the ward, but in the case of very long wards it is more convenient of access if placed at the side; and it is also advisable to place it at the side if the ward may probably have to be subsequently extended in length, in order to avoid the need of its removal. In large wards a second water closet may be

necessary, and may conveniently be of a size suitable for children. The slop sink should be placed in a closet in the same annexe; it should be of a kind suitable to receive slop water and contents of bed-pans—not an ordinary kitchen sink—with a 3-inch waste pipe not discharging over a gully but ventilated like a soil pipe. Water taps suitable for the cleansing of bed-pans and other vessels should be placed over the sink.

CHAPTER VIII.

Cost of Construction of Isolation Hospitals.

The cost of isolation hospitals is frequently reckoned as so much per bed; the total cost, with or without site, being divided by the number of beds provided. But this method, while useful for purposes of comparison where the circumstances are similar, is very fallacious if certain important considerations are neglected. Of these the chief are:—

1st. That a large part of the cost of providing an isolation hospital is made up of items which are necessary for a hospital, however small, such, for instance, as site, fencing and road-making, water supply and sewage disposal, quarters for staff, and offices; and the cost of these items does not increase in proportion to the number of beds. Hence a small hospital must be expected to cost more per bed than a larger one.

2nd. That in view of the need for classification of patients according to sex and disease, the usefulness of an isolation hospital depends not merely upon the total number of beds which it contains, but also upon their being available for use at any time under the varying contingencies of infectious disease that may occur in the district which it serves.

3rd. That it is the total cost of the hospital which is of concern to the ratepayers of a district, rather than the cost per bed.

The cheapest way of providing accommodation for a number of patients is to place them in one large ward, but such an arrangement affords no opportunity for classification, and if the ward contained patients of one sex a patient of the opposite sex could not properly be placed in it, even though there were many beds in it empty. Similarly with different diseases. It would be easy to diminish the cost per bed of a small hospital by making the wards larger; but this would add to the total cost of the hospital, and, if the smaller building were sufficient for the needs of the district, without making it more useful. In a small district for which a hospital of four beds, with facilities for classification, would suffice for the needs likely to arise it will be cheaper to erect such a hospital at a cost of £2,000, or £500 a bed, than to erect a larger one of 12 beds at a cost of £3,000, although in the latter case the cost per bed would be only £250.

But in view of the disproportionate cost per bed of small hospitals, it is advisable to avoid their erection wherever possible, and, as already pointed out, the best way of doing so is usually by the combining of small districts into larger areas for the purpose of hospital provision.

Assuming that the hospital authority possess a suitable site, with facilities for obtaining a water service and for drainage, the cost of erecting a permanent hospital of medium size, say 20 to 30 beds, in accordance with the principles set out in the Board's memorandum, may be estimated at somewhere about £400 per bed, varying from £350 to £500, according to circumstances, such as the size of the hospital, the facilities afforded by the site, the style of the buildings, and the local prices of labour and materials. Where circumstances are favourable and strict economy is exercised it may be sometimes as low as £300 per bed, or even lower; and, on the other hand, £500 per bed has often been much exceeded. A great excess above £500 per bed has generally been due to one or other of the following causes:—

1st. The hospital being a very small one, so that the cost of the necessary works has been divisible between very few beds.

2nd. Difficulties connected with the site involving large expense in such matters as foundations, water supply, and drainage.

3rd. Want of due regard to economy in design, or insufficient supervision and control over the cost of erection.

The first of these causes has already been sufficiently dealt with. As regards the third cause, while the technical advisers of the Local Government Board carefully examine the hospital schemes submitted to the Board for sanction with a view to the avoidance of superfluities, and keeping down the cost to the lowest point consistent with durability and efficiency, effective control over the expenditure can only be exercised by the local authority themselves, under the influence of public opinion in the district, and this is not always operative. On some occasions at public inquiries into applications for loans for hospital purposes involving many thousands of pounds, not a single ratepayer has been present beyond the local officials and perhaps a newspaper reporter, although the proposals were such as appeared to the Board to involve a needless expenditure of public money. The Board also have not infrequently found an indisposition on the part of local authorities to accept suggestions from them tending to reduce the cost of isolation hospitals.

The most frequent cause, however, of excessive cost of isolation hospitals, and the hardest to avoid, is the difficulty of obtaining a suitable and convenient site. A local authority desiring to erect a hospital, in order to get a site at all, often has to buy a larger and more costly one than is necessary for the purpose, to give a higher price per acre than the land would be worth for any other purpose, and to incur heavy legal expenses in meeting opposition;* and not only so, but any site obtainable is often so situated as to involve much further expense in adapting it for hospital use.

* In the Sevenoaks District, the Chiddingstone Hospital Committee, by taking advantage of a suitable piece of land being in the market, were able to obtain a site of six acres for £360, whereas in order to obtain a hospital site for the remainder of the district the rural district council had to seek compulsory powers of purchase and to pay £2,250 for a site of five acres, *see* p. 117.

The opposition to the erection of a hospital for infectious diseases in any particular locality is generally based on the following grounds:—

1. *Sentimental objection.*—

   In one case opposition to a proposed hospital site, sufficient to lead to its abandonment, was raised by a gentleman on the ground that he would be able to see the roof of the hospital through the trees from his house a mile distant.

2. *Exaggerated and unreasonable apprehensions of the risk of infection.*—

   Except in the case of small-pox hospitals, there is no evidence to show that infectious disease ever spreads from a properly constructed and properly managed hospital, where the infected buildings are at the distance from the boundary required by the Board, when waste matters are properly disposed of, and when improper communications between infected persons and those outside are prevented. Nor is there any evidence to show that any danger to the public or to residents on the way attaches to the removal, with due care, of patients to the hospital. *See* remarks on this point in Chapter II.

3. *Depreciation of property.*—

   Wherever it is proposed to erect a hospital it is as a rule immediately claimed that the neighbouring land possesses a building value which will be destroyed if the hospital is erected in its neighbourhood. Hence owners of large estates are often unwilling to sell any site for hospital purposes, for fear of depreciating the remainder of their land, and it commonly happens that the only sites purchasable, except under compulsory powers, are parcels of land which form the whole property of the vendor in that locality, and which may be larger and more costly than necessary, or otherwise not well adapted for building on.

   When, however, a hospital has been built it is not found that its presence prevents the erection of other houses in its neighbourhood; indeed, the laying of water service and sewers to the hospital may facilitate building, though possibly the houses erected may be of a smaller class than might otherwise have been built.

It has to be pointed out that the influence of the site upon the cost of an isolation hospital is by no means eliminated by reckoning the cost per bed as exclusive of site. If the site is remote from sewers and water mains, the cost of drainage and water supply may run into several hundreds of pounds, whether these wants are supplied by making connections of considerable length with the nearest public services, or by constructing independent works on the site. Similarly, remoteness from gas or electric mains may involve expense in works for lighting. If the site is not on a good road, expensive works of roadmaking may be needed in order to secure a proper access. Sometimes the only site obtainable has been an old quarry or other excavated ground where much expense was involved in clearing and levelling the surface, and in securing stable foundations; or in other cases the soft and treacherous nature of the ground or the risk

of subsidence from undermining has added to the cost of foundations. If the site is far from a railway station, with bad or hilly roads, the cartage of building materials will add much to the cost of building, and may render it difficult to procure labour. All these extra expenses are liable to be debited to the cost of the buildings and are not included in that of the site.

The question of the cost of isolation hospitals, in common with that of other buildings of a public character, as lunatic asylums and public elementary school buildings, has received attention especially since 1895, owing to the increased cost of building due to the rise of prices in the building trade which took place in the last quinquennium of the 19th century. During the years 1896-1900 the prices of many kinds of building material and still more the wages in the building trades rose greatly, and the increase of wages is stated to have been accompanied by shorter hours of labour, and a less output of work per hour. In more recent years, with the depression in the building trade there has been a tendency to cheaper prices (*see* the Memorandum by Mr. Kitchin, Appendix D.).

The increase in the growth of local debt, largely due to the cost of public buildings, has also aroused attention, and there has been in some quarters a disposition to attribute the increased cost of buildings to the increased stringency of the requirements of central Government departments. But as regards the construction of isolation hospitals, I am in a position to affirm that there was no increased stringency in the Board's minimum requirements during the period 1892-1910, though no doubt there was during that period a rise in the standard aimed at by local authorities in such matters as provision of small isolation wards, quarters for a larger staff of nurses, and a better accommodation generally, all involving increased expense.

As regards the increased cost of school buildings, a report by a Departmental Committee has recently been published by the Board of Education ([Cd. 5,534—1911]), and their conclusions are in great measure applicable to the case of isolation hospitals. The Committee mention that while in the period immediately following the Elementary Education Act of 1870, it was possible to provide schools in most places at a cost of £5 to £6 per place, the cost of a permanent school erected under favourable circumstances, according to ordinary modern practice, cannot be put much under £10 per place, and a reasonable estimate for an ordinary building designed with a due regard to economy would range from that figure up to £13 10*s.* 0*d.* per place. They attribute this increase of cost in part to the rise in standards of comfort and hygiene and to the development of educational methods, *e.g.*, increased allowance of floor space per child, improved provision for heating, lighting, and ventilation of schoolrooms, reduction in size of classes, and division of the interior into separate classrooms. Another cause of increase in cost, they say, lies in the general rise of building prices and largely a permanent rise in the cost of labour. But they say that local education authorities do not all or always practise the reasonable economies which are in their power; that there has in the past been a liking for florid and pretentious elevations; and that local patriotism sometimes demands a building which shall form a striking feature of

the district. In other cases local authorities are influenced by the laudable desire to have the best building which money can buy, and submit plans and specifications in which no item is conspicuously extravagant, but the highest possible standard is adopted in every respect, the result being a very spacious, durable, finely finished and completely equipped building costing a very large sum per scholar accommodated. No evidence was given that the adoption of an unnecessarily high standard was encouraged, much less required, by the Board of Education, but that Board admit that they cannot without some embarrassment refuse to pass plans on the ground that they are too good.

The experience of the advisers of the Local Government Board as regards isolation hospital schemes has been similar. It is comparatively easy to object to unnecessary and inappropriate ornament or to useless "fads," but it is not so easy, where there is no conspicuous extravagance but only a general high standard of excellence, to refuse sanction to a loan to a local authority who desire to have the best and are willing to pay for it. In such a case an appropriate course might be, without disallowing particular items, to put a reasonable limit upon the total cost of the buildings and leave it to the local authority to find out how to bring the cost within the limit. In hospitals, as in schools, great economies can be secured by good designing and careful attention to details of construction and finish, and by skilful and business-like employment of methods and materials in ordinary use.

Our experience would also lead us to agree with the Board of Education report that competitions for plans are, as a rule, a waste of time and money. If the criterion adopted by the adjudicators be that of economy, there is a risk that the cost of the scheme may have been under-estimated by the successful competitor; if the criterion be theoretical completeness, it may tend to adoption of schemes having features not useful in proportion to their cost. In some cases, schemes which have been adopted after competition have been found by the Board to require modifications which have brought them into resemblance with other schemes which had been passed over, and this has caused dissatisfaction.

Comments are sometimes made on the cost per bed of isolation hospitals as compared with that of other public institutions, as workhouses and infirmaries, and lunatic asylums. The cost of new workhouses erected during the years 1891-1904 varied from £91 10*s.* to £237 per inmate, without site, and from £95 6*s.* to £307, including site. The cost per bed of poor law infirmaries erected apart from workhouses during the same years ranged from £114 to £455 without site and from £181 to £499 with site. The cheapest buildings were in the smaller country unions, and the most expensive ones in London and the large suburban unions. The cost of modern lunatic asylums, as calculated from figures given in the Fifty-Ninth Report of the Commissioners in Lunacy, is usually between £200 and £350 per bed, without site, ranging in extreme cases from £158 to £483, the high cost in the latter case being largely due to distance from a railway

station and expense of cartage of materials. The cost of site is about £20 per bed. A memorandum prepared by me in 1905 on the relative cost of isolation hospitals and lunatic asylums is appended to this report. (Appendix C.) The higher cost per bed of isolation hospitals than of poor law buildings and lunatic asylums is accounted for by the following considerations, which are in large part inherent in the nature of the case.

1. Greater difficulty and cost of obtaining a site owing to objection to proximity of a hospital for infectious diseases.
2. Cost of works of drainage, water supply, &c., often great on account of the isolated situation.
3. The smaller number of beds at an isolation hospital by which the cost of site, works of preparation, administrative buildings and offices is divisible.
4. The standards of space per patient required at an isolation hospital are much larger than those required for the chronic cases which make up the bulk of the inmates of a workhouse infirmary or lunatic asylum.
5. The need for classification of patients according to the diseases from which they are suffering involves multiplication of buildings with consequent increase of cost. In recent years the attention which has been paid to the question of prevention of intercurrent infection and "return cases" has led to a desire for small separate wards, cubicle blocks, convalescent wards and discharge blocks, all of which, though useful, add to the cost.
6. Accommodation for a larger staff in proportion to patients is required at an isolation hospital than at a workhouse infirmary or lunatic asylum, owing to the acute nature of the cases at the former and to their distribution in a number of wards. It is requisite also that the staff of an isolation hospital should be housed in a separate building to the patients.

Cost of permanent as compared with that of temporary hospitals.—Comparisons are sometimes made between the cost of a permanent hospital, which may be £400 per bed, with that of the temporary hospital blocks sold by makers of iron buildings, who offer a wardblock professedly for 12 beds for about £400 or the price of one bed in a permanent hospital. But in making this comparison, several points have to be taken into consideration.

1st.—The maker's list price includes only the bare building above the foundations. Site, fencing, water supply, drainage, foundations, concrete under floor, furniture, and fittings are all extras, and the building, of which the nominal price is £400, may come to cost £1,000 or more before it is completed and ready for occupation. The following are instances:—

(*a*) An iron hospital, of which the maker's price was £400, cost £1,056 when completed.

(*b*) An iron hospital, price £310, cost £1,010 when completed.

(*c*) An iron hospital, price £380, cost £885 when completed.
(*d*) An iron hospital, price £246 10*s*., cost £700 when completed.
(*e*) A temporary hospital of corrugated iron, estimated to cost £290, cost £780, exclusive of site.

2nd.—The hospital blocks offered by makers of iron buildings do not usually afford the Board's standard amounts of linear distance between beds, floor area, and cubic capacity per bed. Thus a ward 30 feet long, 20 feet wide, and 12 feet mean height, may be intended for six beds, giving only 10 feet of wall space, 100 square feet of floor space, and 1,200 cubic feet of capacity per bed, as against the Board's standards of 12 feet, 144 square feet, and 2,000 cubic feet per bed. If the amounts of space were rendered equal by placing more beds in the permanent building, or fewer in the temporary one, the difference in their apparent cost would be proportionately reduced.

3rd.—The accommodation in a temporary block is usually available for one disease only, and affords no facility for classification of patients suffering from different diseases.

4th.—The administrative accommodation in the temporary hospitals on the market is at a minimum. There is only one room for the nurse or, at most, a duty room and a bedroom, and that in the same block as the wards, and the provision for washing, &c., if any, is of the scantiest.

Temporary hospitals are sometimes useful in an emergency, as during an epidemic, in view of the short time needed for their erection provided that a suitable site is available. They may be used on occasion to supplement an existing permanent hospital, which will afford the necessary administrative accommodation, and the Board have in some cases sanctioned short loans for their provision for this purpose.

The objections to them are the deficiencies in space and accommodation already mentioned, their less durability as compared with brick buildings, and their need of frequent repairs, the imperfect protection which they afford against vicissitudes of weather—iron hospitals are hot in summer, cold in winter, and noisy in heavy rain or hail storms—and especially their liability to destruction by fire and storm. Many instances could be quoted in which iron or wooden hospitals have been blown over and wrecked by a gale, or rapidly destroyed by fire, causing suffering and inconvenience to the patients and, in some cases, loss of life. The rapid inflammability is due chiefly to the match-boarding commonly used for the lining of the walls, which has the further disadvantage of affording crevices in which dust and vermin can lodge and of rendering thorough disinfection difficult.

Furnishing and fittings.—The cost per bed of furnishing tends to be greater in a small than in a large hospital, inasmuch as the cost of the furniture necessary for the administration block is divided among fewer beds. On the other hand, in a large hospital likely to be constantly occupied, it will be worth while to provide various labour-saving machines and devices which will effect economy in the working of the hospital, but

which will add to the first cost of furnishing, whereas in a small hospital the appliances may be of a very simple character. The amount of loan for furnishing has varied greatly in different hospitals provided under the Board's sanction; it has been as low as £18 per bed and as high as £50. As a rule it has been lowest in country hospitals, where simple ideas prevail, and highest in those in the neighbourhood of London and other large towns, where there is a tendency to lavishness in public matters. It ought not to exceed £35 per bed, and, indeed, £25 per bed should generally suffice. In some cases the Local Government Board have disallowed loans for the excess of cost of furniture above £35 per bed, and in other cases where the total cost has been high they have disallowed items in the way of luxuries for the staff, as piano, pictures, and billiard table. Furniture for the wards should be of a strong and durable character and such as to be easily kept clean. Enamelled iron furniture is on the market, which is cheap and suitable.

Reasonable provision for the comfort and recreation of the staff when off duty is justifiable, as by the nature of their calling they are much cut off from outside society, but extravagance should be avoided.

As regards fittings and appliances, as already pointed out, in a large hospital likely to be in constant occupation, various labour-saving devices—such as electric lighting, steam cooking, steam laundry machinery, and heating from a central boiler—may be advisable, which it would not be worth while to adopt in a small hospital or in one which, as a hospital for small-pox, may be empty for long periods, as in the latter case any saving which might be effected when the hospital was in use would not counterbalance the interest on the capital expenditure and the depreciation when not in use.

CHAPTER IX.

Suggestions for Reducing the Cost of Isolation Hospitals.

As already mentioned the cost of construction of isolation hospitals is a matter which has received considerable public attention, and suggestions have been made for reducing it.

In 1905 the following suggestions were made in a communication to the Local Government Board by the County Councils Association:—

1. In any isolated and well situated site the cubic space of wards per bed might be reduced.
2. A barbed wire fence or a hedge might take the place of the 6 feet 6 inches wall or park paling which is now required.
3. In small hospitals the irregularity in the number of each sex should be met by having three small wards instead of two wards of equal size.
4. The premises might be warmed by hot water pipes heated from a central furnace instead of by fireplaces with coal fires, thereby saving prime cost, with greater economy in maintenance.

5. Patent impermeable floorings should be allowed, they being cheaper than wood.
6. The internal walls, and in the case of hollow walls the inner 4½-inch brickwork, might be replaced by patent partitions thereby reducing the cost of foundation and plaster, &c.
7. The window frames might be built flush with the inside wall, saving rounded angles, &c.
8. Door linings could be reduced and doors standardised, thus avoiding panels and rounded angles.
9. Windows could also be standardised, and possibly made in cast iron.

As regards the first of these suggestions, the Board would not sanction a loan for a hospital for infectious diseases that was not in an isolated and well situated site. The suggestion therefore is tantamount to one that the Board's standard of 2,000 cubic feet per bed might be generally reduced. This proposal will be considered later on in this report.

As regards the second suggestion, it will be seen on reference to a footnote in the Board's Hospital Memorandum of 1902 that in unfrequented situations—*i.e.*, where there is no public right of access to the boundary of the hospital grounds—a stout hedge or shrubbery between two rows of barbed wire fencing or unclimbable iron railings is accepted in place of a wall or close fence, as a sufficient barrier and screen. A barbed wire fence alone would not be sufficient to prevent undesirable communications passing between convalescents in the hospital grounds and persons outside.

The other suggestions refer to matters as to which no objection would be raised by the Board if they had been proposed by local authorities, but it is doubtful how far they would effect any reduction of cost.

The only points which the Board have hitherto regarded as indispensable are those which are printed in italics in the "Memorandum on the provision of Isolation Hospital accommodation by Local Authorities," *see* Appendix A. These points I propose to consider in order and to discuss how far any relaxation of the Board's present requirements may be regarded as permissible.

1.—*The site, or so much of it as is to form the grounds of the hospital, should be enclosed by a wall or close fence at least* 6 *feet* 6 *inches in height.*

The object of this requirement is to prevent improper communication between convalescent patients and persons outside, such as might conduce to the spread of disease or interfere with the discipline of the hospital.* It is especially necessary at a small-pox hospital, where the patients are often of the vagrant class; more than one outbreak of small-pox has been started by the escape of a delirious patient from hospital. Generally a height of 6 feet 6 inches is necessary to prevent persons looking over the fence.

* *See* report on East Ham Hospital, p. 81.

But the requirement may be, and has been, relaxed where the access of unauthorised persons to the outside of the boundary and of convalescent patients to it on the inside is otherwise prevented. Thus the footnote already mentioned allows in unfrequented situations a stout hedge or shrubbery between two rows of barbed wire fencing or unclimbable iron railing in place of a wall or close fence. It also allows an open unclimbable railing, instead of a wall or close fence, for so much of the boundary as is within supervision and control from the administration block or porter's lodge, provided that a second line of fence is constructed within the first so as to prevent patients getting to the outer boundary.

2.—*Every building which is to contain infected persons or things should be at least* 40 *feet distant from the boundary.*

The object of this requirement is to prevent spread of infection and undesirable communications with persons outside which might take place if the wardblocks were built close up to the boundary, also to secure around the buildings sufficient open space for light and the circulation of air. Long experience at the London Fever hospital and elsewhere has shown that, except in the case of small-pox, a distance of 40 feet in the open air is sufficient to avoid risk from air-borne infection. It is not contended that a distance of, say, 39 feet, 35 feet, or even less would necessarily be insufficient, but it is a good answer to the objections which are frequently raised to the establishment of an isolation hospital in a locality, on the ground that there would be risk of spread of infection from it, to be able to say that the Board require that every building to contain infected persons or things shall be at a distance from the boundary which experience has shown to be sufficient to prevent such a risk. I do not therefore recommend any modification of this rule.

3.—*It is not the practice of the Local Government Board in ordinary cases to sanction loans for iron hospitals or for hospital buildings of temporary character.*

In some exceptional instances loans for such hospitals have been sanctioned in past years. These have been cases of—

(*a*) the erection of temporary buildings, on the occasion of an emergency such as an epidemic, in extension of an existing permanent hospital on an approved site;

(*b*) formidable epidemics so taxing the resources of a district that a short loan to defray the cost of temporary hospitals that had been erected was necessary as a matter of financial relief;

(*c*) the purchase by a local authority of an existing hospital which comprised some temporary buildings.

The objections to iron hospitals or other hospital buildings of a temporary character, as stated in the memorandum, are that it is difficult to maintain them at a proper temperature during extremes of hot and cold weather; that they are less durable than brick or stone buildings and require more frequent repairs

in order to keep them in a properly weather-proof condition, and that they are liable to be destroyed by fire and storm. Moreover, as already mentioned, the ready-made portable hospitals sold by makers do not usually afford the Board's standards of space and are deficient in administrative accommodation.

The Board have however been willing, where a local authority proposed to erect a hospital of temporary construction, to assist them by sanctioning loans for matters which would be of service towards the ultimate erection of a permanent hospital, such as purchase of site, fencing, procuring a water supply, works of sewage disposal, and furnishing, also for brick foundations for temporary buildings, if so planned and constructed as to be suitable for the ultimate erection upon them of permanent buildings.

It is to be observed that the objections to frame buildings as hospitals depend largely upon the match-boarding which usually forms the internal layer of the walls. This match-boarding, as already mentioned, is very inflammable unless specially treated, and presents numerous crevices which harbour dirt and prevent thorough disinfection. Shrinking of the boards opens the crevices and allows cold draughts to penetrate. The substitution for the match-boarding of hard plaster—preferably on a base of wire netting or expanded metal instead of wooden laths—or of an incombustible material in sheets, as at the Capel hospital near Tonbridge,* with means of protection against excessive changes of temperature, would go far to obviate the objections to wooden framed buildings, and the Local Government Board have in fact offered to sanction loans for buildings so constructed, provided that as regards standards of space and other matters they complied with usual requirements. The period allowed for repayment of loan in such cases would, however, be shorter than for buildings of brick or stone; and such buildings would probably cost somewhat more than the ordinary match-boarded ones, so that the immediate advantage as regards annual cost of repayment of loan might not be great.

There may, however, be cases where the shortening of the period over which the repayment of loan extended might be of considerable financial advantage to a district, even if the annual amount to be repaid were as large; as for instance in a district dependent on collieries approaching exhaustion, or in which from any other cause a diminution of the population was likely to take place.

Apart from such special circumstances, moreover, there may be advantages in the adoption of a somewhat lighter form of hospital construction, with a shorter period of loan, as changes in the incidence of a disease, or in the methods of dealing with it, may affect the future usefulness of a hospital, so that it may be obsolete for the purpose for which it was erected before the time when, as a building, it is worn out. The useful life may be shorter than the structural life. Thus, as already mentioned, none of the hospitals described by Sir R. Thorne 30 years ago, are on lines which would be adopted at the present

* *See* page 123 of this report.

day. Durability for all time need not therefore be aimed at in the construction of an isolation hospital. For the same reason a period of loan longer than 30 years for a brick building appears undesirable.

As regards the durability of frame buildings covered with wood or corrugated iron much will depend upon the original strength and careful construction of the buildings, and much also upon the care taken of them and the due execution of repairs as the need arises.

At the Bagthorpe hospital, Nottingham, the wardblocks covered with weather boarding erected in 1885 are now (1911) worn out, but the corrugated iron pavilions erected in 1894 are in fair condition except that the floor is much worn.

At the Brighouse hospital the corrugated iron buildings erected in 1892 were in good condition externally in 1909, but the match-board lining had shrunk, leaving wide crevices in the inner walls.

At the East Ham hospital a corrugated iron building erected in 1893 has been condemned as worn out and is now pulled down. Two corrugated iron pavilions erected in 1902 are not now (1911) in a satisfactory condition, chiefly from the same cause as at Brighouse, viz., the shrinking of the match-board lining.

Timber buildings deteriorate more rapidly than brick or stone ones when unoccupied. For a frame building covered externally with weather-boarding or corrugated iron, and lined internally with plaster or incombustible material (not match-boarding) a period of loan of 10 or 12 years, or perhaps even 15 years, might appropriately be allowed. (The period allowed by the Board for a building of brick or stone is 30 years.) But in the later years of its life a frame building would require frequent expenditure on repairs to keep it in a habitable condition, and it would be undesirable that instalments of repayment of loan should have to be made at the same time.

The Board would no doubt be willing to sanction the use in hospital construction of the more recently introduced materials and methods in any case in which they could be shown to be cheaper than the ordinary materials in use in the locality. The report of the Departmental Committee of the Board of Education already referred to recommended that Local Education Authorities should be encouraged to submit proposals for the use of novel materials or methods of construction for public elementary schools, and that a loan period of 30 years should be regarded as normally appropriate to such cases, instead of the period of 50 years allowed in cases where ordinary methods are used, but that it should be made a condition of approval that provision should be made for the periodical inspection of the structure.

It must be remembered that as many of these special materials are not impervious to moisture buildings constructed of them require to be coated with cement on the outside, and that owing to the thinness of the walls more ample provision for warming is necessary than in brick or stone buildings. Until experience has been obtained of their durability the loan period for such buildings should probably be shorter than for those of brick.

4.—*In the wardblocks each bed must have at least* 12 *linear feet of wall space,* 144 *square feet of floor space, and* 2,000 *cubic feet of air space.*

The reasons for this requirement will be seen from the principles set out in Chapter IV. of this report. They are that the patient as he lies in bed may be at a sufficient distance from any other patient to avoid direct contact and droplet infection; that any exhalations which he gives off may be diluted with a large volume of air, and that the cubic space shall be sufficient to allow the supply of a large volume of fresh air without objectionable "draughts," *i.e.*, currents of great and unequal velocity. But while the Board require that a hospital shall be planned so as to allow the above standards of space for the number of beds proposed, they have little power to prevent the space per bed being subsequently reduced by placing in the wards more beds than it was designed to hold; and this is in fact frequently done on the occasion of an epidemic, or even for the sake of making a profit by taking in patients on payment from other districts.

Of the three standards mentioned above the 12 feet of wall space per bed, *i.e.*, the distance between patient and patient as they lie in bed, is the most important from the medical point of view, but it is unfortunately this dimension which is the one liable to be encroached on. The height and width of a ward cannot be altered and it is rare for beds to be placed in the middle of the ward, but it is easy to place additional beds along the sides, thus reducing the distance between bed and bed.

It would obviously reduce the cost of construction of hospitals if a less amount of space per bed were allowed, in fact the less amount of space given per bed is one of the chief causes of the apparent cheapness of temporary hospitals as sold by the makers of iron buildings, compared with permanent hospitals erected under the Board's sanction; and in practice the difference is often greatly reduced, as already mentioned, by putting into permanent wards more than the authorised number of beds.

I do not feel justified in recommending a less distance than 12 feet between bed and bed in wards for acute cases, unless the beds are separated from one another by a fixed screen; but perhaps some concession might be made in other dimensions. It will be observed that the Board's present standards are not commensurable one with another, and that while a ward on plan C, 24 feet wide, might conveniently afford 12 feet of wall space and 144 square feet of floor space per bed, it would have to be made nearly 14 feet high (13 feet 10·36 inches) in order to give 2,000 cubic feet per bed. But in practice the additional space required in order to obtain the required 2,000 cubic feet per bed is more useful if given as width of ward than as additional height above 13 feet, and the dimensions commonly adopted are therefore 26 feet in width and 13 feet in height, which give 156 square feet and 2,028 cubic feet per bed. But an increase of width from 24 to 26 feet involves a corresponding increase in floor, end wall, and roof, as well as a longer bearing and consequently increased strength of roof timbers. Seeing therefore that the Board's standard would be complied with by a floor

space of 144 square feet per bed with a height of 14 feet, and that the additional height from 13 feet to 14 feet is of comparatively little value for purposes of isolation and ventilation, I suggest that the Board might allow a standard of 1,872 cubic feet instead of 2,000 cubic feet, with a floor space of 144 square feet and a wall space of 12 feet as at present. This in a ward on plan C would correspond to a width of 24 feet and a height of 13 feet. In single bed wards or compartments in which one patient is entirely separated from another with efficient cross ventilation, a less amount of space might be allowed. Thus in the Appendix to the Board's Hospital Memorandum the dimensions of the single bed cubicles are 12 by 12 feet and 10 feet high = 1,440 cubic feet.

The above remarks apply especially to wards in which cases of infectious disease in the acute stage are under treatment. Convalescent patients who are able to get about might be housed in a cheaper form of building, possibly a two-storey one, in which a smaller amount of space per bed might suffice, especially if in addition to the dormitories there were day rooms or open air shelters in which the convalescents might pass the day time.

5.—*The drains of each block should be trapped from the common drain and ventilated separately by an inlet just above the trap and by ventilating shafts at their highest points.*

The object of this requirement is to prevent infected air from the drains of one block passing into the drains of another block in which cases of a different disease may be under treatment. The arrangement is similar to that required for new dwelling houses under Nos. 63 and 65 of the Board's model byelaws as to new buildings, urban series, and the corresponding clauses 17 and 19 of the rural series.

As the question of the advisability of upholding or omitting this requirement is now under consideration by a Departmental Committee on behalf of the Board, I refrain from making any suggestion.

6.—*Hospitals for small-pox.*

1st.—*The site must not have within a quarter of a mile of it either a hospital, whether for infectious diseases or not, or a workhouse, asylum or any similar establishment or a population of as many as* 200 *persons.*

2nd.—*The site must not have within half a mile of it a population of as many as* 600 *persons, whether in one or more institutions or in dwelling houses.*

3rd.—*Even where the above conditions are fulfilled a hospital must not be used at one and the same time for the reception of cases of small-pox, and of any other class of disease.*

The reasons for this requirement were originally set forth in an intra-departmental memorandum on small-pox hospitals written in 1893 by Sir R. Thorne, the Board's then medical officer. In view of subsequent corroborative experience—*see, e.g.*, Dr. Reece's report on small-pox at Liverpool and Dr. Buchanan's report on

small-pox in the Orsett Rural District, I do not suggest any modification.

Other points mentioned in the memorandum on the provision of isolation hospital accommodation, though generally necessary, are not regarded as indispensable in every case, especially in small hospitals; regard must always be had to the circumstances of the individual case, and more especially to the requirements and resources of the district and the nature of the site.

As already pointed out, a suitably designed and constructed hospital for infectious disease, owing to its comparatively small size and the need for isolation, must necessarily be an expensive establishment, reckoned as cost per bed, as compared with establishments of most other kinds. The best suggestions that can be offered for keeping the cost within a reasonable figure are the combination of small districts to form an area of suitable size; the careful selection and judicious purchase of a site; the engagement of a competent architect; the avoidance of superfluities—generally it will be found most economical to follow as nearly as circumstances permit the lines of the Board's model plans—and careful general supervision, with a view to cut down unnecessary expenses and get good value for money. In all these directions much more can be effected in the way of economy by the local authority themselves than can be done by the Local Government Board without local aid.

CHAPTER X.

Summary.

1. The general conclusions with respect to the construction and use of isolation hospitals set forth in Sir R. Thorne's report "On the use and influence of hospitals for infectious diseases," issued by the Local Government Board in 1882, still for the most part hold good so far as they go, except that under the circumstances of the present day a single central isolation hospital may with advantage serve a considerably larger area than was found practicable at the time when Sir R. Thorne wrote. None of the individual hospitals described by him in the second part of his report can, however, be taken as models which could with advantage be closely followed at the present time.

2. Every populous district should be provided with hospital accommodation for the reception of cases of infectious disease, at least for such as are without proper lodging and accommodation or which occur under circumstances involving special danger to the public health. The proportion of cases which it may be desirable to isolate in hospital will vary to some extent with local circumstances.

3. The diseases most commonly received into isolation hospitals are scarlet fever, diphtheria and enteric fever. It is undesirable that isolation hospitals should be reserved solely for scarlet fever, to the exclusion of diphtheria and enteric fever which are more formidable diseases.

When not in use for the acute infectious diseases isolation hospitals may be used for the treatment of cases of pulmonary phthisis.

4. Small-pox should be treated in separate hospitals, which should be in isolated situations and may conveniently serve a larger area than hospitals for the other acute infectious diseases.

5. In the case of small districts combination for the purpose of isolation hospital provision is to be preferred to the establishment of small separate hospitals for the following reasons:—

(*a*) Combination enables economy to be effected by avoiding duplication in site, fencing, water supply and drainage, administrative accommodation and offices; since the provision for these matters which would be necessary for a hospital however small, may suffice with but little increase for a considerably larger one.

(*b*) It facilitates the classification of patients in respect of the diseases from which they may be suffering.

(*c*) It enables a competent staff to be more easily maintained.

6. In all isolation hospitals patients are liable to be sent in under mistaken diagnoses, suffering from diseases different from that supposed. They may also be sent in bearing the germs of a second infectious disease, or the septic organisms to which complications are largely due. It is, therefore, necessary that at an isolation hospital accommodation should be provided for the separate treatment of doubtful or mixed cases, and also that even in the treatment of patients suffering from the same disease care should be taken, especially in the acute stage, to avoid risks of cross-infection.

7. The degree of separation necessary to avoid cross-infection varies in different affections. In those of short "striking distance" a mere space between bed and bed sufficient to prevent direct contact and the transference of droplets of mucus in coughing, &c., together with careful "aseptic" nursing may suffice; but in diseases of which the contagium is of a more diffusible character there should be complete aerial separation.

8. Wardblocks in isolation hospitals are of two principal types illustrated by the Board's plans C and B. In the former the wards contain a number of beds—four or more—each, and are connected together in one block by enclosed communication. For the simultaneous treatment of a number of cases of the same disease, this form of wardblock is the cheapest per bed to construct and the most convenient to administer. In the latter type the wards contain one or two beds only, and are separately entered from the open air. This form of wardblock is suitable for the isolation of doubtful or mixed cases; it costs more per bed to erect than a block of the other type and involves more work in attendance, but owing to the facility which it affords for classification of patients a given number of beds can be used for a greater variety of cases than in large wards.

9. Cubicle blocks in which each patient is separately lodged in a glass-walled cell are a form of the last mentioned type of ward, the degree of separation varying in different designs. They have considerable advantages for isolation purposes, but require a high standard of nursing with scrupulous attention to details.

10. The objections to temporary buildings for hospital purposes—such as timber-framed buildings covered externally with

corrugated iron or weather boards, and lined with match boarding—are their less durability as compared with brick buildings and their need of frequent repairs; the imperfect protection which they afford against vicissitudes of weather; and especially their liability to rapid destruction by fire and storm. The ready-made buildings supplied by makers are also commonly deficient in space and accommodation. The inflammability is chiefly due to the matchboard lining, which has the further disadvantages of affording crevices in which dust and vermin can lodge and of rendering thorough disinfection difficult.

The apparent cheapness of such hospitals as compared with permanent buildings is discounted by the considerations,

1st, that the maker's list price includes only the bare building above the foundations. The cost of site, fencing, foundations, furniture, water supply, drainage, &c., is all extra and is often more than that of the building itself;

2nd, that the space per bed allowed in such buildings is much less than the Board's standard, and that they are commonly very deficient in means of classification of patients, accommodation for staff and other requisites.

11. In the construction of walls and floors of wards the aim should be to secure a smooth impermeable surface, free from crevices, and capable of being readily cleansed. The particular construction may differ in different cases, but where it is desired to keep expense to the lowest point a smooth limewashed wall and a boarded floor covered with good floor-cloth might suffice.

12. Open fireplaces suffice for the warming of small wards, but in large wards may conveniently be supplemented by radiators warmed by hot water, especially when a considerable elevation of temperature has to be effected, as in cold situations. Hot water radiators are not recommended as the sole method of warming. Central stoves may be dispensed with where radiators are provided. Down-draught stoves are liable to smoke unless the height of upcast flue is ample.

13. Natural ventilation by windows suffices for hospital wards, but the heat of stoves may be usefully employed as a supplementary means of introducing warm air and extracting foul air.

Other details of construction are referred to in Chapter VII. and in the Board's Hospital Memorandum, *see* Appendix A.

14. Earth closets are not suitable for hospital use. There is no objection to admitting hospital sewage into sewers, and no need for any preliminary sterilisation.

15. The cost of isolation hospitals reckoned per bed is necessarily high as compared with other public institutions for the reasons:—

1st, that being of smaller size the cost of site and of the necessary works and installations has to be spread over comparatively few beds;

2nd, that the need for classification of patients according to sex and disease involves a multiplication of wards;

3rd, that in view of the patients being in acute illness provision has to be made for a comparatively large staff.

Excessive cost per bed is usually due to:—

1st, the hospital being very small so that the cost of site and necessary works is divisible between very few beds;

2nd, to high cost of site or difficulties in adapting it for hospital purposes, involving large expense in works such as road making, water supply, sewage disposal and foundations.

3rd, less frequently, to want of due regard to economy in design, or insufficient supervision and control over the cost of erection.

The increased cost of erection of hospitals in recent years has been mainly due to the great increase in prices of materials and wages in the building trades, which took place in the closing years of the 19th century. It has not been due to any increased stringency in the Local Government Board's requirements.

16. The cost per bed of furnishing will vary to some extent with the size of the hospital, but should not exceed £35, and may often be considerably less.

Expensive labour-saving appliances are not of advantage in buildings which are rarely full and may be unoccupied for long periods.

17. The keeping of the cost of an isolation hospital within reasonable and moderate limits is a matter which rests chiefly with the local authority erecting it. The principal suggestions which can be made are the combination of small districts into suitable areas of sufficient size for hospital provision; the careful selection and judicious purchase of a site; the employment of a competent architect; the avoidance of superfluities and unnecessary ornament; and careful supervision over the execution of the work.

18. It is suggested that the present minimum requirements of the Local Government Board might be relaxed in respect of the following matters:—

(*a*) Short loans (10-15 years) might be sanctioned for timber-framed or other temporary hospital buildings—provided that:—

1st, the buildings were of sufficiently substantial construction to last for the period of the loan.

2nd, that they were lined with plaster, asbestos sheets, or other incombustible material, instead of with match-boarding.

3rd, that, except as regards the construction of the walls, they complied with the Board's usual requirements.

(*b*) In wards of the ordinary type a capacity of 1,872 cubic feet per bed instead of 2,000 cubic feet might be sanctioned, with a floor space of 144 square feet, and a wall space of 12 feet as at present. This would allow a pavilion containing two rows of beds to be 24 feet wide, instead of 26 feet, and 13 feet high.

In properly ventilated cubicles and single-bed wards in which the patient is completely separated from any other a further reduction of cubic space might be allowed.

Index to hospitals reported upon.

Number.	Page.	Hospital Authority.	Situation of hospital.	Area of district in acres.	Population of district 1911.	Area of site in acres. ‡	Number of ward blocks.	Number of beds sanctioned.	Cost of site.	Total cost of hospital.	Cost per bed		Special points.
											with site.	without site.	
									£	£	£	£	
1	69	Acton Urban District Council.	Acton ...	2,305	57,523	3¾	Original hospital.						Original hospital of brick. Administration block an old house unsuitable for the purpose. Steam laid on to hospital from town destructor for heating. New block, 1911, of concrete slabs 4 inches thick, cheap, not yet in use at time of visit.
							3	33†	—	17,420 (ex.site)	—	528	
							Hospital as enlarged in 1911.						
							4	69	—	22,070 (ex.site)	—	320	
2	71	Bridport Town Council.	Pitwell, Allington, in Bridport Rural District.	672	5,919	4 (3)	1	8†	690	2,490 (incl. site)	311	225	The low cost per bed of this hospital is due to its comprising a single wardblock containing a number of beds larger apparently than the borough has needed.
3	73	Brighouse Joint Hospital Board.	Clifton, Halifax Rural District.	11,771	34,238	5	3	30†	900	12,835 (incl. site)	428	398	Buildings partly of corrugated iron.
4	74	Colne and Holme Hospital Committee.	Meltham ...	45,686	61,239	19 (5)	4	50†	900	23,310 (ex.site)	484	466	Very complete and well equipped.

* Patients are also received under agreement from other districts.
† The number of beds for which the hospital was designed, in accordance with the Local Government Board's standards of space, is in practice exceeded.
‡ The figures in brackets show the area enclosed to form the hospital curtilage, where the whole area is not used for hospital purposes.

Index to hospitals reported upon—continued.

Number.	Page.	Hospital Authority.	Situation of hospital.	Area of district in acres.	Population of district 1911.	Area of site in acres. ‡	Number of ward blocks.	Number of bed sanctioned.	Cost of site.	Total cost of hospital.	Cost per bed		Special points.
											with site.	without site.	
									£	£	£	£	
5	76	Croydon Rural and Merton Joint Hospital Board.	Beddington Corner, in Carshalton Urban District.	22,780	78,074*	19 (6) (p. 76)	5	62†	4,500	33,840 (incl. site.)	546	473	Costly site. Isolation block of special cruciform design.
6	77	Cuckfield Rural District Council.	Gate House Lane, Hurstpierpoint.	54,095	16,853	14½ (part only)	3	24	1,000	13,000 (incl. site.)	541	500	High cost per bed partly due to price of site, clay soil, and cost of road making, laying on water, and works of sewage disposal.
7	81	East Ham Town Council.	East Ham ...	3,324	133,504	17½	Permanent. 3	58†	10,000	27,729 (incl. site.)	478	306	Administration block and two pavilions of corrugated iron, erected out of current rates. Isolation block of special design containing 12 single-bed rooms, on either side of central corridor.
							Temporary. 2	40					
8	85	Gloucester Town Council.	Over, Gloucester Rural District.	2,314	50,029*	24 (6½)	3	40	3,958	25,564	639	540	Site unnecessarily large, and involved much expense in laying out, road making, and sewage disposal. Details of buildings, fittings, and furniture unnecessarily elaborate and expensive.

9	89	Huddersfield Town Council.	Huddersfield, 2 miles from centre of town.	11,559	107,825	18	4	112† (+8 phthisis)	4,635	54,371 (incl. site)	485	444	Hospital erected by loan under local Act without Board's sanction. Construction expensive; wardblocks built on arches, and connected by covered corridors on raised causeways. In addition to permanent buildings there is a temporary building for eight phthisis cases.
10	94	Kirkburton Isolation Hospital Committee.	Kirkburton...	17,305	20,789	4½	2	24	292	9,988 (incl. site)	416	404	Cheap site purchased out of current rates. Ends of large wards in pavilion partitioned off to form convalescent rooms.
11	95	Lydd Town Council.	Lydd ...	12,082	2 874	½	1	6†	Belonged to Corporation.	1,550	—	258	Hospital a single two-storey building, containing two 2-bed wards and kitchen on ground floor, and a 2-bed ward and rooms for staff on first floor.
12	97	Newport, (Monmouthshire) Town Council.	Allt-yr-Yn, Newport.	4,504	83,700	5¼	4	54†	2,578 with some buildings.	23,831 (incl. site)	441	394	Site costly, and its steepness involved extra expense in building. Separate laundry for staff provided, but found unnecessary.
13	101	Nottingham Town Council.	Bagthorpe ...	10,935	259,942	12½	4	112†	2,500	Permanent buildings. 32,000	—	— 285	Hospital erected without Board's sanction, partly by loan under local Act of 1883, partly out of current rates. The wardblocks are connected by enclosed brick corridors, which are used for the "open-air" treatment of patients. In addition to the permanent wardblocks there are temporary blocks and converted farm buildings, used for phthisis cases.

* Patients are also received under agreement from other districts.
† The number of beds for which the hospital was designed, in accordance with the Local Government Board's standards of space. is in practice exceeded.
‡ The figures in brackets show the area enclosed to form the hospital curtilage, where the whole area is not used for hospital purposes.

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Number.	Page.	Hospital Authority.	Situation of hospital.	Area of district in acres.	Population of district 1911.	Area of site in acres. ‡	Number of ward blocks.	Number of beds sanctioned.	Cost of site.	Total cost of hospital.	Cost per bed		Special points.
											with site.	without site.	
									£	£	£	£	
14	110	Penistone Isolation Hospital Committee.	Hoyland's Moor, Hoylandswaine Urban District.	34,990	18,341	4	2	14	Given to Hospital Committee.	6,000 (ex.site)	—	430	Site given and hospital erected with special regard to economy, but the small number of beds involves higher cost per bed.
15	111	Rhondda Town Council.	Ystrad, in Urban District.	23,885	152,798	5	2	32	800	15,836 (incl. site)	495	470	Hospital has been erected in sections out of current rates, but is designed on lines similar to the Board's, and is substantially built with elaborate and costly finish and fittings. Steep site, involving much excavation.
16	114	Settle Rural District Council.	Austwick, Settle Rural District.	152,007	14,902	5	2	20	600	6,528 (ex.site)	356	326	Low cost of hospital due to: (1) building stone abundant in neighbourhood; (2) sewers and water service available; (3) buildings and fittings, though good and substantial, are of simple design.
17	116	Chiddingstone Isolation Hospital Committee.	Hever, Sevenoaks Rural District.	25,822	8,239	6 (part only).	2	12	360	6,750 (incl. site)	562	532	Wardblocks of special design, each containing a 3-bed, 2-bed, and 1-bed ward. Site purchased out of current rates.

17	116	Sevenoaks Rural District Council.	Otford, Sevenoaks Rural District.	37,514	15,791	5	2	12†	2,600	9,300 (incl. site)	775	587	Wardblocks similar to those at Hever Hospital. The excessive cost of this hospital as compared with Hever was due to the difficulty of obtaining a site. Administration block made large enough to serve for temporary buildings already on the site.
18	118	Stroud Joint Hospital Board	Cainscross, Stroud Rural District.	39,987	39,872*	4 (3½)	4	44	650	12,538 (incl. site)	285	270	Low cost of hospital due to: (1) site cheap for building land, and sewers, water service and gas available; (2) price of building is low in the district; (3) hospital, though substantially built and sufficiently equipped, is of plain and simple design and ordinary materials.
19	123	Tonbridge Rural District.	Capel, Pembury, Tonbridge Rural District.	46,853	17,771	3	1	10	Original hospital, 1887. 300	2,700 (ex.site)	300	270	Old block of brick, erected by loan in 1887. New block erected out of current rates, of corrugated iron lined with Eternite (asbestos) slabs, used for 16 beds. Difficulty has been found in warming it.
							1	10†	New iron block. —	575 and extras.	—	About 58–60	
20	125	Tunbridge Wells, Tonbridge and Southborough Joint Small-pox Hospital Board.	Dislingbury, Pembury in Tonbridge Rural District.	53,902	75,271	10 (2½)	2	22†	700 with buildings.	2,325 (incl. site)	105	—	The Joint Hospital Board were able to buy cheaply a site with existing buildings which serve for administration purposes. The wardblocks are of temporary character and do not afford Board's standards of space per bed.

* Patients are also received under agreements from other districts.
† The number of beds for which the hospital was designed, in accordance with the Local Government Board's standards of space, is in space exceeded.
‡ The figures in brackets show the area enclosed to form the hospital curtilage, where the whole area is not used for hospital purposes.

Index to hospitals reported upon—continued.

Number.	Page.	Hospital Authority.	Situation of hospital.	Area of district in Acres.	Population of district 1911.	Area of site in Acres. ‡	Number of ward blocks.	Number of beds sanctioned.	Cost of site.	Total cost of hospital.	Cost per bed		Special points.
											with site.	without site.	
									£	£	£	£	
21	126	Undercliff Isolation Hospital Committee.	Ventnor ...	6,542	9,058 (1901)	1¾	1	4†	leased 999 years. £16 p.a.	3,420 (ex.site)	—	855	The high cost per bed of this hospital is explained by its small size and few beds. Difficulties with water supply, for which special pumping arrangements are necessary.
22	127	Waltham Joint Hospital Board.	Honey Lane; Waltham Holy Cross Urban District.	16,859	38,366	10 (2)	4	40	1,400	14,850 (incl. site)	371	336	Hospital of simple design but well equipped, cost moderate.
23	129	Walthamstow Urban District Council.	Chingford Urban District.	4,343	124,597	19¾	4	82	2,625	42,212	515	482	A cubicle block containing 12 cells, separated from one another by glass partitions and separately approached from open air under verandahs. A convalescent block of special design.
24	134	West Ham ...	Plaistow ...	4,683	289,102	3¾	7	212	7,718	146,327 (incl. site)	690	637	Two-storey blocks, connected by corridors, on confined site. "Barrier system" of nursing in operation.

† The number of beds for which the hospital was designed, in accordance with the Local Government Board's standards of space, is in space exceeded.
‡ The figures in brackets show the area enclosed to form the hospital curtilage, where the whole area is not used for hospital purposes.

1.—Acton Isolation Hospital.

The Acton Urban District, which adjoins the western boundary of London, has an area of 2,305 acres, with a population which increased from 37,744 in 1901 to 57,523 in 1911. The northern part is mainly residential in character, but in the southern part the inhabitants are almost entirely of the working class, many being engaged in laundry work, and as this is interfered with by the occurrence of infectious disease in the household, the removal of the patient to hospital is generally sought.

In 1903 the district council purchased for £13,400 the Friars Estate in their district, an old house and grounds containing 13 acres of land, to be used for various public purposes, and assigned a portion of it, containing the house and $3\frac{3}{4}$ acres of land, as a site for an isolation hospital, the house serving as the administration block. On another part of the ground, about 600 feet from the nearest hospital building, a dust destructor has been erected by the council; no nuisance from this is said to arise at the hospital, and it furnishes steam which is utilised for heating purposes. The site adjoins the main line of the Great Western Railway, along which a large number of trains, including many expresses at a high rate of speed, pass at all hours. The soil is clay. Public water supply and sewers are available.

In 1902 the Board sanctioned a loan of £9,900 for the erection of a hospital, and further loans of £3,350 and £2,123 in 1904 for excess of cost and supplementary works. In 1907 a loan of £510 was sanctioned for heating apparatus for the ward-blocks, the stoves originally provided having proved insufficient, and in 1910 one of £1,537 for laying on steam from the destructor to the hospital.

The hospital as originally constructed contained two pavilions each with a six-bed and an eight-bed ward, also an isolation block containing two two-bed and one one-bed wards, total 33 beds, according to the Board's standard, though at time of pressure a considerably larger number of beds is placed in the wards. The cost per bed up to this point works out at £528 per bed, exclusive of site. Furnishing cost £32 per bed.

In 1910-11 the need for extension having been felt a new block containing 36 beds was erected, under sanction from the Board, constructed of concrete blocks, at a cost of £4,650, or at the rate of £129 per bed. With the addition of this block the hospital has cost up to date, £22,070 for 69 beds, or £320 per bed.

The hospital is used chiefly for scarlet fever. Enteric fever is rare in the district, and diphtheria has not been prevalent during the last few years.

I visited the hospital on September 19th, 1911, with Dr. D. J. Thomas, medical officer of health.

The administration block is not a convenient building for its purpose: it is a four-storey building, with one storey below the main floor, though not much below the ground level. The staircases are narrow, steep, and winding, and there are some awkward turns in the passages. The bedrooms though large are too few, and three or four nurses have to sleep in one room. The

building is not attractive in appearance, and its retention as an administration block appears to have been a mistake even on economical grounds. Its adaptation cost some £2,000, instead of £700 as was first estimated; and £70-80 a year has, I am told, to be expended to keep it in repair. If it had been abandoned the hospital could have been placed on another part of the estate farther from the railway.

In the original pavilions the wards are light and airy: the upper part of the ward is in the roof; the floors are of wood blocks in fair condition. The walls of the wards are distempered above a painted dado; those of the lobbies are lined with glazed bricks. There is no bath-room proper, the bath standing in a space off the hall. It is a movable one, and the original intention was that it should be wheeled into the wards and used at the patients' bedside; but this is found inconvenient, and the space above mentioned is used as a bathroom, being screened off by a curtain when in use: this arrangement is complained of as inconvenient. The wards were originally heated by central double fireplaces with upright brick flues, but the warming being found insufficient, hot water radiators were added. The water is heated in calorifiers by steam, under Reck's patent system. The steam was originally furnished from a boiler in the basement of the laundry block, but subsequently a steam main was brought from the boiler at the destructor, and heats both the circulating water and the hot water supply. The destructor, however, is only alight from Monday to Saturday, and at week-ends it is still necessary to use the boiler. The steam main cost £747, but as the steam was previously wasted it is considered that it has been worth the cost, especially as the steam is used in substitution for electric power in the laundry. It is claimed that during the first quarter of 1911, when the steam was first in full use, there was a saving of £84 in fuel as compared with the corresponding period of the previous year. The saving would be chiefly in the two winter quarters, but there would be some saving all the year round in steam for hot water supply, laundry purposes, and disinfection.

The new block was at the time of my visit nearly completed, but not yet furnished, and had not been used. It contains an 18-bed, a 16-bed, and two single-bed wards, total 36 beds. The walls are supported by steel stanchions, 12 feet apart, which carry the roof. Between these the walls are filled in with blocks of clinker concrete 4 inches thick, keyed together in cement mortar. They are rendered outside with a coat of cement and sand, ¾ inch thick, and inside with "Sirapite" cement. The ceiling is of fibrous slabs, and the roof is tiled. The floor is of a composition called "newoleum," laid together without joint, which is guaranteed to last five years. The ward windows are alternately of the sash and of the casement kind; a sash window in one wall being opposite a casement window in the other: above the transoms they have hopper lights of the usual kind. There is to be a double central stove with descending flue in each large ward; there are also hot water pipes all round the ward with a swinging radiator under each window. There is a large hit-and-

miss ventilator under each bed, and also under each radiator. Ample means of warming will no doubt be found necessary in view of the thinness of the walls, but there is as yet no experience on this point. The walls already showed signs of cracking on the side nearest to the railway. There are two bathrooms with fixed baths in the centre portion of the block, one entered from each ward. Attached to the duty room is an outside pantry for food, approached by a small verandah. The doors of the wards have a plain smooth surface without mouldings or panels.

The cost of this block, including road-making and drains but without furniture was £4,000, or for 36 beds, £111 per bed. Per cubic foot it worked out to 4·66*d.*, as against 6·9*d.* for the original brick pavilions, but in the latter the wards were of smaller size, and an increase in length of wards adds to the number of beds without adding proportionately to the cost.

Some of the prices were: walls 5*s.* 10*d.* per square yard complete; floors, 4*s.* 2*d.* per square yard; ceiling slabs, 1*s.* 6*d.* per square yard; doors, 1*s.* 1*d.* per square foot.

It is too soon to speak of the suitability of the new pavilion, but it is stated that it proved weather proof in a heavy storm of rain on May 31st, 1911, when 3½ inches of rain fell at Acton.

There was a considerable prevalence of scarlet fever in Acton in 1907-9, and there were many return cases. In 1907 there were 267 notifications and 6 deaths. 246 cases were removed to hospital, and following the discharge of convalescents there were seven return cases, one "return case" seems also to have followed home isolation.

In 1908 there were 484 notifications of scarlet fever from 376 houses and 15 deaths. 390 cases were removed to hospital and there were 27 "return cases." The medical officer of health considered that "The most fruitful cause probably is the overcrowding of wards, and the failure to separate the convalescent from the acute cases."

In 1909 there were 468 certifications of scarlet fever in 371 houses; and 16 deaths. 311 cases were removed to hospital, and there were from these nine "return cases," while seven "return cases" occurred after cases isolated at home.

One hundred and nine notifications in 1910—2 deaths; 77 removed to hospital; 1 "return case."

2.—Bridport Borough Isolation Hospital.

This hospital was erected by means of loans sanctioned by the Board in 1896 and 1897, viz., £690 for site and £1,800 for buildings, and was opened in 1898.

I visited it on May 2nd, 1907.

The site is at Pitwells, in the parish of Allington, in the Bridport Rural District, but only just outside the borough boundary. It is four acres in extent, but only three acres are used for hospital purposes, being enclosed by a close oak fence 6 feet 6 inches in height, the remainder of the land being let.

The town council gave an undertaking not to treat cases of small-pox on the site, but they rent a piece of ground a quarter of an acre in extent adjoining the hospital enclosure, and approached from it, on which they have erected a Berthon hut

for cases of small-pox; this hut is only 16 feet from the boundary, and the land is in part fenced only by wire netting or by a low hedge.

The hospital site is in an elevated situation with south aspect and sandy soil; the town sewers, gas and water supply are available, but difficulty has occurred owing to insufficiency of pressure of water, and water has had to be carted to the hospital in dry summers.

The hospital buildings comprise a single wardblock on the pavilion plan, with two wards, 27 feet long and 24 feet wide; these were intended for four beds each, but there were six beds in one at the time of my visit. The ward floors were of red deal blocks set herring-bone fashion, and were in good condition. The corners of the ward were rounded but not the floor angles. The walls were distempered but were damp on the exposed side. Ordinary kitchen sinks had been fixed instead of hospital slop sinks. The wards are lighted with gas, there being in each two pendants each with 12 jets, but these had been found to burn too much gas and eight of the 12 jets in each pendant had been stopped up.

There is a movable bath, hot water being obtained from a geyser heated by gas; this has been found sufficient hitherto, hot water being obtained in two minutes from lighting the geyser.

There is a small laundry block, containing a disinfecting closet with a lamp for disinfection by formalin gas. There is also an administration block containing three bedrooms.

The resident staff consists of a caretaker and his wife who have done all the nursing during the five years that they have been there. Extra nurses would, however, be hired if necessary.

The hospital had been little used during the two years that the present medical officer of health had been in office. Only one case of scarlet fever and one of diphtheria had been admitted in 1906. The largest number of cases in the hospital at one time had been five; these were cases of diphtheria from a boarding school.* A charge of 2*s.* a day, or 1*s.* 6*d.* each for two members of one family is made to persons in a position to pay, but no charge is made to poor people. All the cases sent in during the time of the present medical officer have been his own patients, and have been medically attended by him while in hospital.

The cost of this hospital per bed (authorised) has been £311, or £225 without site. These are low figures, and judged in this way, the hospital, notwithstanding its small size, has been a cheap one. But the total cost of the hospital, £2,490, is not so low for a town of only 5,962 inhabitants; the quotient per bed is low because the divisor is large, the number of beds being greater apparently than the borough requires. If instead of erecting a pavilion of eight beds the council had erected a block on the Board's plan B. it would have been ordinarily sufficient for the needs of the district and would have enabled cases of different diseases to have been treated at one time; but, assuming

* Three cases of scarlet fever and five of diphtheria are reported to have been admitted in 1910.

the cost of the block to have been the same, the reduction of the number of beds to four would have doubled the cost per bed.

It is to be regretted that it was not found practicable to arrange for the use of this hospital for cases from the Bridport Rural District as the same accommodation with small additions might well have served for both districts. In 1903 there was a proposal to form a joint hospital board, and a local inquiry was held by one of the Board's Inspectors, but the proposal fell through owing to a disagreement between the two councils as to who should be first chairman of the joint board. Since that time the rural district council have purchased an iron hospital for 10 beds, at a cost of £542, exclusive of site, foundations, &c.

3.—Brighouse Joint Hospital.

This hospital was originally erected in 1892 in order to cope with an outbreak of small-pox. In 1893 the Brighouse Joint Hospital Board was formed, comprising representatives of the Borough of Brighouse, the Hipperholme and Southowram Urban Districts, and the Halifax Rural District, with an aggregate population (1891) of 35,284, and the hospital was taken over by that board, at first as one for small-pox. The original buildings were all temporary ones of wood and corrugated iron, and they cost £5,020. In 1895 a loan of £900 was sanctioned for the purchase of the site and one of £6,600 for buildings, viz., for the erection of new permanent administration block and isolation wardblock, and for certain portions of the temporary buildings. The condition was made that other portions of the temporary buildings, which the Local Government Board regarded as objectionably situated in relation to the other buildings, should be removed.

In 1898 the Local Government Board sanctioned a loan of £2,000 for a short period (five years) for the remainder of the cost of the temporary buildings (less certain deductions), and also one of £2,160 for hospital purposes, including furnishing, on the condition that the hospital should not in future be used for small-pox.

An enlargement of the laundry with provision of steam machinery was made in 1899-1901, the cost (£1,175) being defrayed out of a sum of money received by way of compensation from Halifax.

The hospital as completed comprises two iron pavilions, each with two 5-bed wards, and an isolation block on the lines of the Local Government Board's former plan B., having in each wing a 3-bed and a 2-bed ward—total 30 beds (nominally). There are also an administration block with eight bedrooms, the kitchen, owing to the slope of the ground, being placed in the basement; a laundry block with steam disinfector, and an iron block, part of the original hospital, now used as a linen store, with a basement in which is the boiler for the heating apparatus. Other buildings on the site, mostly of iron, are used as porter's lodge, stables, mortuary, and a "quarantine" building, which may be used as a temporary shelter for "contacts," or as an occasional ward.

The total cost of the hospital appears to have been about £12,835, or £428 per bed—without site £398 per bed. This is not a very low figure, seeing that many of the buildings are of corrugated iron.

I visited this hospital in June, 1909, with Dr. Kaye, county medical officer. The site is at Clifton, in the Halifax Rural District, in a fine elevated open situation with a south aspect overlooking the Calder valley. It is five acres in extent, and the grounds are nicely laid out.

The corrugated iron blocks erected in 1892 or 1893 were externally in good condition, but the matchboard lining had shrunk, leaving gaping crevices between the boards. The roofs are unceiled and have ridge ventilators. It was stated, however, that there was no difficulty in keeping the wards warm, as there is in each ward a powerful stove in addition to hot water pipes, heated from a central boiler, which are carried all round the wards. I found nine beds instead of five in each ward, the wards measuring 32 feet long by 18 feet wide; there was only 7 feet 6 inches of wall space per bed.

At the isolation block I found also that a greater number of beds had been placed in the wards than would give the standard allowance of 2,000 cubic feet of space per bed; in the end wards, intended for three beds in each, there were five, and in the centre wards intended for two beds there were four. The verandahs, which are on alternate sides of the block, have been completely enclosed, and as the roof of the verandah is higher than the tops of the windows the effect is that the wards are deprived of direct through ventilation. The movable baths provided for this block are little used, and a bath has been placed in the water-closet, a space rather cramped for the purpose.

The experience of this hospital, in spite of some deficiencies, is stated to have been satisfactory; there have been few "return cases," and no cases of cross-infection. Although there is no probation ward, and cases are occasionally sent in wrongly diagnosed, none, I was informed, had contracted disease in consequence.

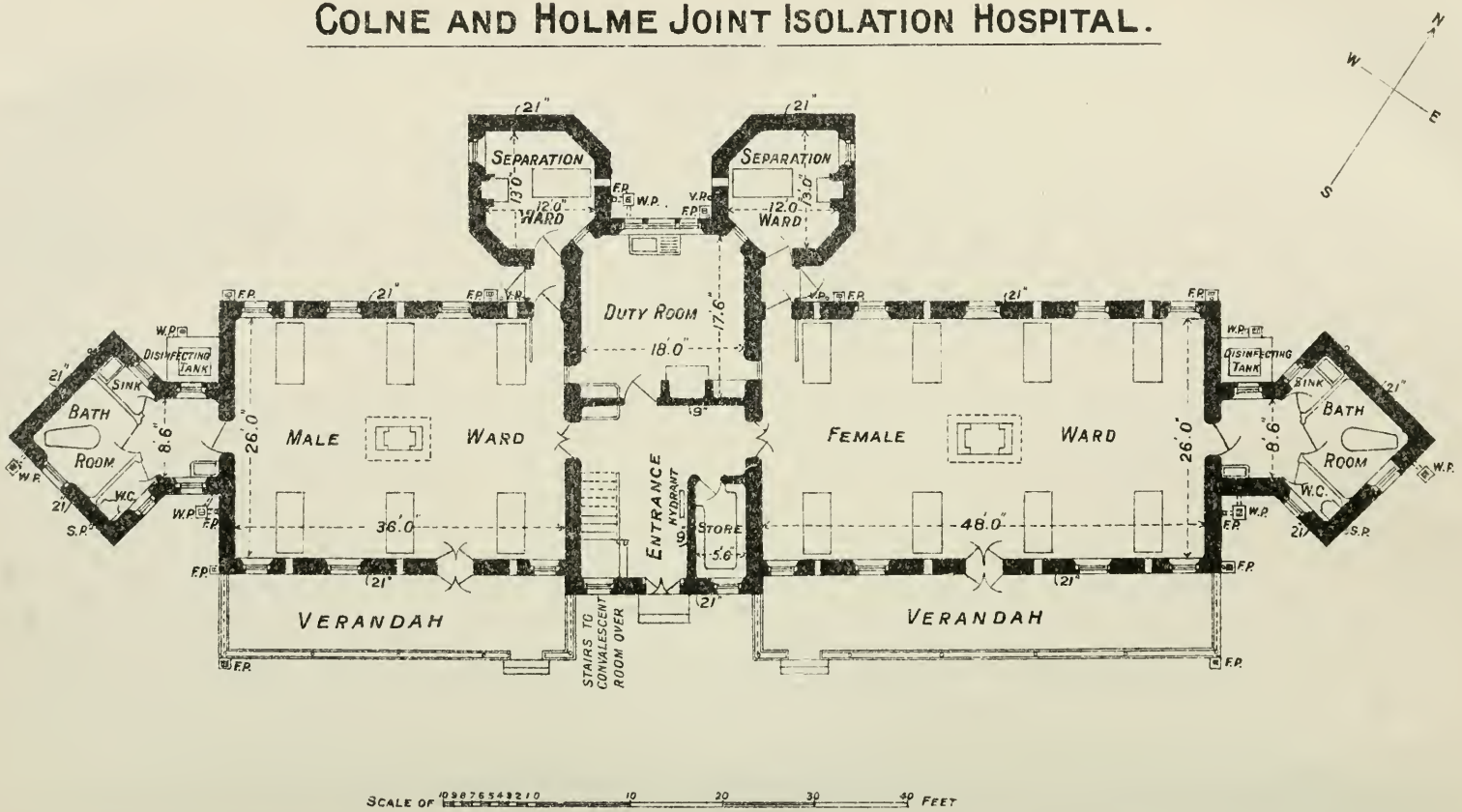
The final bath of convalescent patients is generally given in an empty ward some hours before discharge.

4.—Colne and Holme Joint Hospital, Meltham, near Huddersfield.

The Colne and Holme Hospital District was formed by Order of the West Riding County Council in January, 1899, and comprises 13 "urban" districts—some of them with populations of a few hundreds only—lying in the hilly country to the south and west of Huddersfield. The aggregate population of the hospital district in 1901 was 53,108. An appeal against the Order was dismissed by the Local Government Board.

In March, 1901, a loan of £900 was sanctioned for the purchase of a site, and in March, 1902, one of £23,744, for the erection of a hospital of 50 beds. There was, however, after the erection of the hospital an unexpended balance, which was partly employed in carrying out some further works which had been found

COLNE AND HOLME JOINT ISOLATION HOSPITAL.



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necessary, and the total cost of the erection of the hospital was £23,310, equal to £466 per bed, or including site £484. The site is on Meltham Moor in Meltham Urban District, in an elevated and exposed position between 775 and 850 feet above sea level. The land purchased was 19 acres, but only the lower part of this, about five acres, forms the hospital enclosure. The upper part of the land is crossed by the conduit of the Huddersfield Corporation Water Works, but this is outside of the enclosure and well away from it on a higher level, a substantial stone wall intervening. The hospital is drained into the Meltham sewers, and is supplied with water from a spring on the site; this water, however, has the disadvantage of being ferruginous, and iron-moulding linen.

The hospital buildings comprise three pavilions, one isolation block, administration block, laundry block, and porter's lodge. Of the pavilions, one contains an 8-bed and a 6-bed ward; another, in addition, two single-bed wards, and the third two 6-bed and two single-bed wards. Each of them also has a convalescent room on the first floor in the centre of the block—*see* plan.

The isolation block has two wings facing in opposite directions, with in each wing a 2-bed and a 1-bed ward.

The administration block contained originally 15 bedrooms, but this accommodation having proved insufficient an extension adding six bedrooms was made out of the unexpended balance.

The laundry block contains receiving room for soiled linen, wash-house with steam machinery, drying closet, ironing room, disinfecting rooms with steam disinfecting apparatus, boiler house, engine house, electric light plant, small destructor furnace with chimney shaft, mortuary with viewing lobby, and ambulance and van shed with stabling, &c. The porter's lodge has attached discharging rooms for convalescent patients.

The hospital, which was designed by Mr. Berry, architect, of Huddersfield, is a very complete and well-equipped one, though the cost per bed is not low. It was opened in October, 1904. I visited the hospital in June, 1909, with Dr. Kaye, county medical officer, and Dr. Webster, medical superintendent.

I found that somewhat more beds were put in the wards than they were designed for, thus an 8-bed ward contained in addition four cots. The floors of the wards, which were of narrow maple boards, had shrunk, forming wide crevices between them. The warming of wards by the Musgrave stoves originally provided had been found insufficient owing to the bleakness of the site, and those with descending flues were found liable to smoke. In consequence a system of heating by radiators, with hot water from a central underground boiler, had been constructed out of the unexpended balance of loan, and this was said to have effected a great economy in fuel.

The single-bed wards attached to the pavilions, and the convalescent rooms on an upper floor were said to have been found very useful on occasion. The hospital had been much used, especially for scarlet fever, but there had been few "return cases," and no cases of cross-infection.

5.—Croydon Rural and Merton Joint Hospital District.

Beddington Corner Hospital.

The hospital erected by the Croydon Rural District Council (now transferred to the Croydon Rural and Merton Joint Hospital Board) is situated in an outlying part of the Carshalton Urban District, but close to Beddington Corner in the Croydon Rural District, from which it is approached by a bridge over the River Wandle, which forms the boundary between the two districts. The site was purchased by means of a loan of £4,500 in 1895. The total extent of land purchased was 19 acres, but only 5 acres were at first enclosed for hospital purposes. The original hospital was erected by means of loans amounting to £17,500 in 1897-8 and contained accommodation, on the Board's standard of space, for 28 beds. It comprised two pavilions (plan C), each with a six-bed and a four-bed ward, also an observation block (on plan B) with four two-bed wards. In addition, there were provided an entrance lodge, administration block, laundry block, with stabling, discharging block, and mortuary and post-morten room. In 1901 a loan of £700 was sanctioned for heating apparatus. The cost per bed of the hospital as thus constructed was high, viz., £650 without site and £810 including site. Subsequent additions, however, although adding to the total cost, have diminished the cost per bed.

In 1904 a further loan of £6,400 was sanctioned for extensions of the hospital, including a pavilion with two 10-bed and two single-bed wards and a day room over the centre, also an enlargement of the laundry block with provision of steam machinery and a destructor furnace.

These additions had the effect of reducing the cost per bed of the enlarged hospital to £492 without site and £582 with site.

In sanctioning the loan, the Board pointed out the need for additional observations wards, the existing observation block being in part reserved for cases of puerperal fever.

In February, 1910, a loan of £4,740 was sanctioned for further additions, including an isolation block of special design containing 12 single-bed wards. This extension again reduced the cost per bed, viz., to £473 without site or £546 with site.

The hospital was visited by me in May, 1911, in company with Dr. Fegen, medical officer of health; Dr. Cave, resident medical officer; and Mr. Chart, architect and surveyor. The object of the visit was especially to see the new isolation block which is on a novel plan designed by Mr. Chart which will be best understood on reference to the accompanying plate. It is of cruciform shape having a large central octagonal duty room and four wings, each of which contains three single-bed wards completely separated from one another by plate-glass partitions as in the Board's plan D, which indeed it resembles, except in having four wings with three rooms in each, instead of two wings with two rooms in each. The wings point to N.W., S.W., S.E., and N.E. The wards are entered separately from open verandahs. The verandahs of the N.W. and S.W. wings, which are used for females, are continuous with each other, meeting on the W. side at an angle in which is placed the annexe containing the w.c. and slop sink. The verandahs of the S.E. and N.E. wings,

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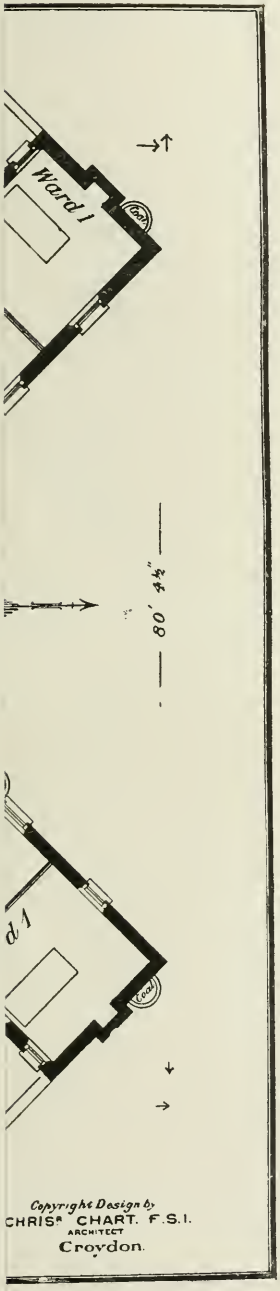
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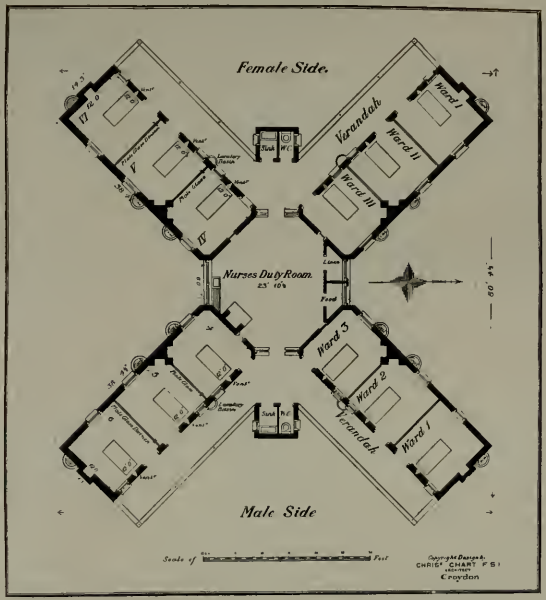
CROYDON RURAL AND MERTON JOINT HOSPITAL DISTRICT.

BEDDINGTON CORNER HOSPITAL.

New Isolation Block.



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which are used for males, are similarly arranged. The area of each ward is 144 square feet, and its height 10 feet, giving 1,440 cubic feet. There is one square foot of window area to each 70 cubic feet of space. The wards are warmed by fireplaces on the floor level, without grates. To each ward there is an external coal-bunker built of reinforced concrete, of hopper shape, opening by a door at the bottom into the ward at floor level close to the fireplace. This arrangement is said to effect a great saving of labour, as there is no need to carry coals into the wards; the bunkers are accessible to carts, and the carter, when delivering coals, has only to empty a sack into each bunker.* There is a lavatory basin in each verandah, with two pedal-action taps (which, of course, cannot be used simultaneously by one person), for hot and cold water respectively; these are said to have given some trouble in frosty weather, the pipes being exposed.

The experience of the new block is said to have been quite satisfactory; the nursing has not presented any difficulty, and there have been no cases of cross-infection. It is found convenient to place young children in the rooms nearest to the duty room.

The cost of this block, including drainage (£120), was £2,195, or £183 per bed.

The other blocks follow more usual designs. They are solidly built: the floors are of terrazzo, and the walls lined with glazed brick, or with plaster distempered. No complaints were made of the terrazzo as being hard and cold, but it was cracked in places.

The warming, by central stoves, of the pavilion first erected was found insufficient, and a system of heating by warm water was subsequently adopted.

The observation block on plan B. is now little used, the new cubicle block being preferred for observation purposes. At my visit two of the wards had been used as a laboratory, while the other two were reserved for typhoid fever.

In all the pavilion wards at this hospital I found a considerably larger number of beds than the wards were designed to contain in accordance with the Board's standard of space, though they were not overfull of patients at the time of my visit. These additional beds are placed in the wards in order to enable the Joint Hospital Board to take in patients on payment from the Caterham Urban district, and from the Guards' barracks at Caterham.

6.—Cuckfield Rural District Council's Hospital, near Burgess Hill, Sussex.

This hospital was visited, with Mr. Kitchin, on March 8, 1907, on a request from the district council, in view of the occurrence of several "return cases" of scarlet fever following the discharge of patients from the hospital.

This hospital was erected by means of loans amounting to £13,000 sanctioned by the Board in 1900 and 1901.

The site is at Gate House Lane, in the parish of Hurstpierpoint, in the southern part of the rural district, in an isolated

* The cost of these coal bunkers was £4 7*s.* 6*d.* each.

situation. It cost £1,000, and is of 14½ acres in extent, but only the portion of the site furthest from the road is used for hospital purposes. The Burgess Hill Water Co.'s water is laid on, but sewage has to be disposed of on the site.

The hospital buildings comprise—

1. Entrance lodge. This is next the public road and outside the hospital enclosure proper. There is an arrangement by which the opening of the gate rings an electric bell in the lodge.

2. Administration block, containing nine bedrooms. It is stated that this is larger than is required for the ordinary staff, but not larger than might be needed if the hospital were full

3-4. Two pavilions, each with a 6-bed and 4-bed ward. These, as designed, do not follow the Board's plan C. The measurements of the wards exceed by 1 foot 4 inches, in each dimension, the Board's standards; being 27 feet 4 inches wide, 14 feet 4 inches high, and 25 feet 4 inches (the 4-bed wards) and 37 feet 4 inches (the 6-bed wards) in length. The verandah is of advantage, but the absence of a bath-room was complained of as very inconvenient.

5. A block with two 2-bed wards on the lines of plan B. in the Board's hospital memorandum, 1900. Total, 24 beds.

6. Laundry block—with Thresh's steam disinfector, mortuary, ambulance-shed, and tool-house.

Of the pavilions, one is reserved for scarlet fever and the other for diphtheria; and the smaller ward block for enteric fever. All were in use at the time of our visit, but the two latter contained each but a single patient, one ward in each being empty. The scarlet fever pavilion, however, contained a number of patients—children—extra beds having been put in for their accommodation. Most of them, however, were convalescent and at play in the verandah. The total number of beds in the hospital is given by the medical officer of health as 28, though the Board's sanction was for 24.

We observed that the exposed end walls of the ward blocks had been rough-cast in their lower part and hung with tiles above; and it was explained that this had been done to keep out the damp. It was stated that the cavity originally proposed to be left in these walls had, by the advice of the rural district council's architect, being filled up with a patent composition, but that this, so far from proving a protection, had been found to conduct moisture from the outer to the inner wall: hence it had been found necessary to cover the walls in the way mentioned.

The papyrolith floors of the wards and administration block are badly cracked, but this appeared to us to be due to settlement of the ground rather than to defect of the material. The terrazzo floors of the verandahs were as badly cracked as the papyrolith floors of the wards; and the direction of the cracks in each case showed them to be due to the foundations having sunk beneath the weight of the superincumbent walls—the soil being wet clay —with consequent bulging upwards of the ground between the walls.

Apart from the above no evidence or complaints of defective building work came under our notice.

The sewage disposal, by settling tanks, continuous bacterial filters, and subsoil irrigation on prepared plots of ground, was working satisfactorily, and the final effluent, in a roadside ditch, was clear and colourless.

This hospital has been a somewhat costly one, the cost per bed, for 24 beds, being £541 with site, or £500 without site. It is not quite clear why this should have been, as the buildings are of a plain description and generally on the lines of the Board's plans, though the dimensions of the wards give a larger space per bed than usual, and a larger laundry block was built than was originally intended. The contract for the buildings (the lowest tender) was £9,399, or £391 per bed, and in addition there were heavy items of £300 for laying down a water main outside the site, and of £300 for bacteria beds, and £500 for road-making. The site was larger than necessary, and a smaller one at less cost, if it could have been obtained, would have sufficed. The heavy clay soil, too, may have added somewhat to the cost of the works.

Owing to the 4-bed block being appropriated for enteric fever —of which only seven cases, all in the male sex, have been treated since the hospital was opened in 1902—there is, in practice, no ward available as a probation ward or isolation ward for the reception of a case of which the nature may be doubtful, or of one in which a second disease may supervene. The need for such a ward is the greater, inasmuch as patients are sent in by their own medical attendants, through the inspector of nuisances, without being previously seen either by the medical officer of health or by Dr. Parry, the hospital doctor.

There is no discharge block: the final bath being given in the nurse's duty-room, which is previously sprayed with formalin by the inspector of nuisances—a method laborious to the staff and trying to the patient. A caution, of which a copy is appended, is given to parents of patients on their discharge.

The hospital was opened for patients on August 14th, 1902. Between then and the end of 1910 the number of cases under treatment has been as follows:—

Year.	Scarlet Fever.	Diphtheria.	Enteric Fever.	Other.	Total.	Deaths.
1902	3	—	—	—	3	Nil.
1903	17	18	5	—	40	Nil.
1904	58	22	1	—	81	1
1905	54	24	—	—	78	1
1906	45	35	—	—	80	Nil.
1907	52	6	1	2*	61	Nil.
1908	41	37	—	—	78	1
1909	37	27	1	—	65	3
1910	50	1	—	—	51	Nil.
	357	170	8	2	537	6

* One case a baby being nursed by its mother.

The percentage of admissions to number of notified cases of the three diseases treated in hospital, viz., scarlet fever, diphtheria,

and enteric fever in the Cuckfield Rural District has been as follows:—

Year.	Per cent.
1902, in part	79·5
1903	82·4
1904	96·0
1905	85·1
1906	96·0
1907	67·7
1908	71·5
1909	83·3
1910	60·6

The average length of stay of patients in hospital has been, in days:—

——	1904.	1905.	1906.	1907.	1908	1909.	1910.
Scarlet Fever	38·7	52 5	56·5	50·5	46·6	32·9	46·3
Diphtheria	32·0	31·1	32·1	31·4	35·9	27·2	11
Enteric Fever	35·0	Nil.	Nil.	70	Nil.	31·0	Nil.

Since the opening of the hospital to the date of our visit seven instances had occurred in which the return home of a convalescent from hospital had been followed by another case or cases of scarlet fever in the same family. The dates of these were as follows:—

Group.	Discharge of first case.	Commencement of subsequent case.	Remarks.
I.	Aug. 27, 1904...	Aug. 30, 1904...	In Groups I. and II. the families were related, and in III. near neighbours. Other sources of infection were suspected.
II.	Sept. 14, 1904	Sept. 12, 1904 Sept. 20, 1904 Sept. 25, 1904	
III.	Sept. 17, 1904 (2 sisters).	Sept. 20, 1904	
IV.	July 29, 1905...	Aug. 3, 1905 ...	Infecting patient was found on Aug. 5 to have discharge from nose, and was readmitted.
V.	Sept. 21, 1906	Sept. 23, 1906 Sept. 27, 1906 Sept. 28, 1906 Oct. 3, 1906 ...	A jacket worn by first patient before taken to hospital was put away undisinfected, and was fetched out on her return.
VI.	Dec 11, 1906 (disinfected clothes returned Dec. 22, 1906).	Dec. 31, 1906... Jan. 2, 1907 ...	
VII.	Jan. 12, 1907...	Jan. 22, 1907 (2 cases).	

The particulars of these cases were carefully investigated and reported on at the time by Dr. Stott, and suggestions made by him for making the precautions observed in the discharge of patients as complete as practicable. These appear to have been adopted so far as can be with the existing appliances, but the provision of a discharge block, recommended by him in 1904, had not been made.*

* A discharge block has been erected since our visit.

In addition to the above cases, there had been two in which patients admitted with one disease had contracted another while in hospital. One of these was a boy convalescent from enteric fever, who, on his journey home after discharge, was taken ill with scarlet fever. The facts could not be ascertained with certainty, but it appeared probable that while convalescent he had associated in the hospital grounds with other children convalescent from scarlet fever. The other case was a boy convalescent from diphtheria, who, in the fourth week after admission developed chicken-pox, contracted from some unknown source. Copy of caution to parents of discharged patients:—

CUCKFIELD RURAL DISTRICT COUNCIL.

Isolation Hospital.

1.—It is presumed that the patient is disinfected and quite free from infection upon the discharge from the hospital, but parents should note the following:—
2.—Children should not return to school for at least three weeks.
3.—Children should, as far as possible, be allowed to sleep alone; they should not kiss others on the lips, and should be kept apart for the first week.
4.—If any discharges from the nose or ears occur, or any rash appear, communication should be made at once to the medical officer of health, at the Council's Offices, Haywards Heath.

7.—EAST HAM ISOLATION HOSPITAL.

The East Ham Isolation hospital was visited by me on April 28th, 1911, in company with Dr. Benton, medical officer of health.

The site of this hospital was purchased by means of a loan of £10,000 sanctioned by the Board in 1899. It is 17½ acres in extent, and is situated in the southern part of the borough in an exposed situation, having on the south a wide extent of open marshes between it and the River Thames and docks; on the north side the site is bounded by the embankment which carries the northern high-level outfall sewer of the London County Council across the marshes to the outfall at Barking Creek. The site is enclosed by a close wooden fence. On the north side the fence has, with the consent of the London County Council, been carried up the sides and along the crest of the sewer embankment; as prior to this being done the site was overlooked in an undesirable manner by people passing along the embankment, which is used as a footpath. Rough men made rude remarks to the staff, and mothers calling to their children made them discontented and unwilling to stay in the hospital. The soil is gravelly; and a public water supply is available.

A loan of £1,511, for the construction of a roadway for access to the hospital, of a sewer and fencing of the site, was sanctioned in 1903.

In 1902 the town council had erected on this site, out of current rates, a temporary hospital of corrugated iron lined with match-boarding, consisting of a central two-storey administration block connected by short corridors, one on each side, with

two pavilions. The pavilions each contain two wards, and each ward contains 10 beds; but this gives an allowance of only 8 feet of wall space and 96 square feet of floor space per bed. One pavilion is used for diphtheria and the other for phthisis cases.

These pavilions are complained of as cold and draughty. Owing to the shrinking of the match-boarding, strong currents of air come through the crevices between the boards, as could be seen on the day of my visit by the blowing about of a curtain hung up against the wall; and it has been found necessary to provide screens around the head of the bedsteads. The floors are of boards covered with linoleum, which is still, after nine years' use, in serviceable condition. The means of heating originally provided were double-faced central stoves, with thick brick stacks carried up through the wards, but in 1909 these were supplemented by radiators, and at the same time a constant supply of hot water was laid on. Previous to this the hot-water supply had been obtained from geysers heated by gas; this means had been found insufficient and not without danger, as was evident by the charred state of the match-boarding near the former position of the geysers.

The annexes and bath-rooms to this block are very small and cramped.

According to the annual report for 1902 of the then medical officer of health, this building was erected in view of the prevalence of enteric fever in the district. It was commenced in August and opened on December 8th, 1902: and the makers' price, exclusive of foundations, fittings, and furniture, was estimated at about £1,000.

Prior to the erection of this hospital the then East Ham Urban District Council had three separate hospitals, for diphtheria, enteric fever, and scarlet fever respectively. Of these the two former were old dwelling houses utilised as hospitals, they did not afford sufficient space and were otherwise unsatisfactory. The scarlet fever hospital was a corrugated iron building erected in 1893 on a site near the sewage works. On the acquisition of the present site this building was removed thither, but it has since been condemned as worn out, and has been pulled down.

There is also on the site a temporary shed used as a quarantine building for "contacts." In addition to the present temporary buildings there are the following permanent buildings which have been erected by means of loans sanctioned from time to time by the Board, viz:—

Pavilion A.
Pavilion B.
Isolation block.
Laundry block.
Porter's lodge.
Residence for medical officer.

Of these, block B was erected by loan sanctioned in December, 1905. It is on the Board's plan C, and contains two large wards, two single bed wards, and a day room for convalescents on the first floor over the duty room. The large wards were nominally

for 12 beds each, but a larger number have been placed in them, and the medical officer of health in his annual report for 1909 gives the amount of cubic space per bed as only 1,000 cubic feet.

The block is well built and has been found satisfactory. The floors of the wards are of oak blocks, polished; those of the lobbies are of terrazzo, which over the furnace chamber has been badly cracked by the heat. The walls of the wards are ornamented by coloured pictures printed on paper, and glazed over together with the rest of the surface with a preparation called paripan. The wards are heated by radiators and also by double central stoves with down draught, which are said to act satisfactorily. The convalescent room is spacious and well-lighted, and is found very useful.

Under the centre of the block is a heating chamber containing a large boiler for circulation of hot water for heating purposes, and a smaller boiler for hot water supply. This chamber is unventilated; the air in it was stifling from sulphurous fumes at the time of my visit on a breezy day, and must be detrimental to the health of any one who may have to work long in it.

Block A is a two-storey building, and was opened in October, 1909. The ground floor contains two 12-bed wards for scarlet fever, which have been so far but little used. The floors are of material similar to that in the cubicles, and are, at present, in good condition.

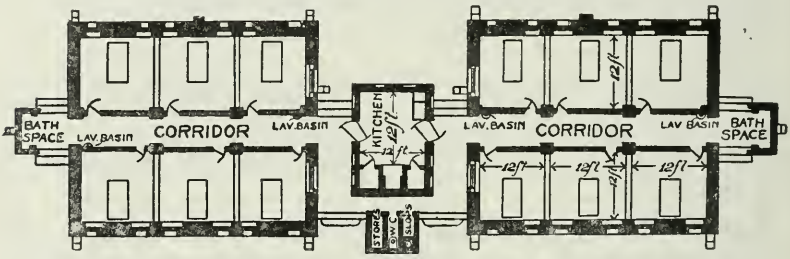
The first floor, which is approached from the outside by a staircase at one end and has an emergency staircase at the other end, contains 12 bedrooms and sitting rooms for the nurses and staff employed in the scarlet fever blocks; the nurses employed in the other wards being lodged in the old administration block. In the corridor are cupboards, one for each nurse, in which she leaves her uniform when she comes from the wards before entering her room. There is a lift for food, the cooking for the whole establishment being done in the old administration block. Under the centre of block A is a heating chamber containing a large boiler for the warming of this block and the isolation block, and a smaller one for hot water supply. The large boiler was a second-hand one, and appears not to be well adapted for its present purpose; it is said to be wasteful of fuel, burning 8-10 tons of coal per week, and the circulation to the isolation block is defective. The chamber is built in such a manner that the present boiler could not be removed and a new one substituted without knocking down much brickwork to obtain a sufficient opening.

(There are, it will be observed, three heating chambers at this hospital, viz.: one under block A, one under block B, and one for the administration block and temporary wards, each chamber containing a large boiler for heating and a smaller one for hot water supply.)

The isolation block is thus described by Dr. Sowden, then medical officer of health, in his annual report for 1909.

"In the centre is the nurses' duty room; on each side of this are six cubicles arranged three on each side of a central corridor. There is through ventilation at each end of the corridor and additional ventilation in the roof by means of louvred openings. A separate overall is provided for each cubicle, which is put on by the nurse before entering to attend to the patient. On leaving, it is taken off, and the hands are washed before attending to any other patient. For this purpose four hand-basins, each supplied with hot and cold water, are placed in the corridor. This routine is necessary to avoid any danger of cross infection. The inner walls of the cubicles are of glass; this enables patients to see into the adjoining cubicle, and also into the cubicle on the opposite side of the corridor, and prevents the loneliness and fear a young child might otherwise have in being alone in a room,"

East Ham Isolation Hospital.



To this description I have to add the following particulars:—

The rooms measure 12 feet square, and contain 1,500 cubic feet, they are ventilated by windows on the outer wall and by an opening into the corridor. The means of warming provided are radiators, supplied from the boiler under block A, but owing to the defective circulation already mentioned the warming is found insufficient. The present medical officer of health in his annual report for 1910 says: "I regret that we have not been able to make more use of the cubicles owing to insufficient heating, but this is now under consideration by the council, and I hope the trouble will be remedied before the summer is over."

The taps over the hand-basins are ordinary bath screw-down taps, which need turning off by hand.

The floors of the lobbies and rooms are of a red composition containing sawdust. The sawdust wears away with use leaving roughnesses. The floors are also complained of as involving much labour to keep clean, as they have to be first washed and then rubbed with a mixture of oil and red ochre.

There is only one water-closet for the whole block, bed-pans being mostly used. There are no bath-rooms, but there are spaces in which movable baths are kept; these are of inconvenient shape being too deep, with straight sides and flat bottoms.

The corridor is complained of as being cold and draughty, but apart from this and the insufficiency of the warming, the experience of this block has been satisfactory, no cases of cross infection having occurred in it. At the time of my visit there were only a few cases of measles in it.

8.—City of Gloucester Isolation Hospital.

The present hospital for infectious diseases other than small-pox for the city of Gloucester is situated at Over in the Gloucester Rural District, about a mile west of the city. The site is on a mound between the rivers Severn and Leadon. The original site, which was purchased by means of a loan of £3,500, sanctioned by the Board in 1897, comprised 30½ acres, of which 11 acres were severed from the rest by the Newent branch of the Great Western Railway, here in a cutting. The original proposal was to erect on this site two hospitals, one for small-pox and the other for other infectious diseases, but it was found that in order to secure between the two hospitals the distance of a quarter of a mile, as required by the Board's regulations, they would have to be placed on the lowest and least desirable parts of the site. Hence the idea of using a portion of the site for a small-pox hospital was abandoned, and another site for small-pox purposes was acquired at Field Farm, a mile N. of the city.

In 1901 a further plot of 8 acres of land adjoining the Over site was purchased for the sake of getting a better approach to the hospital, and at the same time the 11 acres severed by the railway were sold. The net cost of the site was thus £3,958 15*s*.

Only 6½ acres are actually appropriated to form the hospital enclosure, apart from approach road, &c.

Water is obtained from the corporation main which passes the site: it comes from a well in the new red sandstone at Newent, and is very hard. Sewage is disposed of on the site by septic tanks, bacterial filters, and a prepared irrigation area, the natural soil being heavy lias clay.

The hospital, which was opened in 1902, contains 40 beds, and is used chiefly for scarlet fever and diphtheria; enteric fever cases being received at the Gloucester General hospital. A few cases are taken in from the Gloucester Rural District. It is stated that practically all cases of scarlet fever in the city are removed to hospital within a few hours of notification, removal being pressed by the town council for school reasons.

The hospital was visited by me on March 20th, 1907, in company with Mr. Kitchin, the Board's architect, and Dr. Hope, medical officer of health for the city of Gloucester.

The hospital buildings comprise administration block with 14 bedrooms; two pavilions on the lines of the Board's plan C, each having two 8-bed wards; isolation block, with four 2-bed wards, on the general lines of the Board's plan B, with modification, the verandahs both being on the same side with a S.E. aspect, and being enclosed with movable panels.

Laundry block. This contains foul wash-house, wash-house, drying closet, ironing room, and boiler house. On the other

side of a paved yard is another block containing mortuary, post-mortem room, ambulance and van shed, and stables.

Disinfecting block. This is a corrugated iron building removed to this site from that of a former hospital. It contains a Washington Lyon's apparatus and upright boiler.

Discharge block.

Porter's lodge.

The wards have glazed brick dados. The floors are of granolithic, laid in sections, which in places have cracked. The bath-room and mortuary walls are lined to the ceiling with glazed tiles.

The hospital has been a costly one; the loans sanctioned by the Board have amounted to £24,780, this being at the rate of £619 per bed, or £532 exclusive of site. The site was much larger than necessary, and a smaller one, if it could have been obtained, would have sufficed at a less cost. It is said that the cost of the buildings was increased by the town council having first struck out various items from the contract as unnecessary, and afterwards re-instated them at 5 per cent. additional charge as extras. The following items also have added to the cost:—

The annexes to the wardblocks are larger than necessary, each containing two w.c's where one would have sufficed. These annexes are fitted with the best class of sanitary fitting, and are finished internally with a glazed surface.

The plumbing work generally is of an elaborate and expensive character. In particular each bath-room is fitted with a spray-bath—seven in all—which cost about £12 each, and are in practice hardly ever used. Leadless glazed porcelain cisterns and sinks have been used in all the closet and sink annexes.

Separate boilers for the laundry and disinfecting apparatus were unnecessary.

An expensive mortuary and post-mortem room has been provided. These rooms are finished with glazed wall surface and are fitted with expensive fittings and electric light. The post-mortem room is harly ever used and the mortuary had not been used at all during the year previous to our visit.

A good deal of expense has been involved in road making and terracing the grounds, and in the system of sewage disposal.

The hospital as originally constructed was found to have an insufficient supply of hot water for patients' baths, and extra boilers and cylinders had to be put in. One bath-room in the administration block was found to be insufficient for the use of the nurses and servants, and a second bath-room had to be made by dividing the original bath-room by a partition. The two bath-rooms thus made are rather inconveniently small.

The roofs of some of the attic rooms in the administration block are too low.

The furnishing of the administrative block has been carried out in a somewhat absurd and an expensive manner, for instance, the nurses' dining-room is supplied with carved oak chairs covered in morocco leather, and the medical officer's room is also supplied with carved oak chairs of a mediæval design.

The following statement was given us of the cost of this hospital:—

CITY OF GLOUCESTER.

Infectious Diseases Hospital, Over.

Cost of to 31st March, 1905.

	£ s. d.	£ s. d.	
Buildings, Furniture, &c.:—			
Buildings	16,500 0 4		
Furniture	664 9 11		
Ambulance, vans and harness	203 15 0		
		17,368 5 3 =	For 40 beds, £434 per bed.
Site		3,958 15 0 =	99 ,, ,,
Laying out, &c.:—			
Electric cable	183 18 6		
Water main	221 19 5		
Septic Tank Co. account	88 0 0		
Railings	57 12 3		
Trees and shrubs	130 17 6		
Materials for drains, roads, &c.	606 12 6		
Corporation labour and clerk of works	2,480 15 8		
		3,769 15 10 =	94 ,, ,,
Law Charges, &c.:—			
Law charges	337 17 9		
Miscellaneous	129 8 9		
		467 6 6 =	12 ,, ,,
Total		£25,564 2 7 =	£639 per bed.

Area of Site after crediting Land sold off:—

Hospital purposes	11 acres.
Remainder	13 ,,
Total	24 acres.

City Surveyor's Office,
Guildhall, Gloucester,
20th March, 1907.

The medical officer of health, Dr. Hope, acts as medical superintendent of the hospital, and attendant on the patients, but those patients who prefer it may be attended by their own doctor if they pay him themselves.

Scarlet fever and diphtheria patients residing in the city are admitted free. In the cases of those attended by their own doctors, extras are charged for (*see* rules appended).

For cases removed from the workhouse (in the city) or from the workhouse homes (in the city) a charge of 30*s.* per week is made.

An agreement has been made with the Gloucester Rural District Council to receive (if there should be room) patients from that district at a charge of 40*s.* per week, 10*s.* is also charged for removing each patient with the ambulance.

During 1905 two patients from the rural district were received but none during 1906.

Cases of enteric fever are usually treated at the Gloucester General hospital and not at the isolation hospital.

If there is room at the Field Farm hospital, small-pox patients would be received from the workhouse and also from the Gloucester Rural District, in which cases the guardians or the Rural District Council respectively would be required to repay the corporation the actual cost of each such patient.

It is stated that three instances of "return cases" of scarlet fever, *i.e.*, secondary cases following the return of a convalescent from hospital, occurred in the time of the previous medical officer of health, but none have occurred in Dr. Hope's time.

No cases of scarlet fever have been followed by diphtheria. In one case a patient with roseola, but sent in as with scarlet fever was placed in a scarlet fever ward and contracted the latter disease.

A similar accident happened to a patient who was sent in late at night from the rural district as with scarlet fever, and was placed in a scarlet fever ward. In four cases this year nasal discharges have come on after the return of a patient from hospital, but none of them have been followed by secondary cases, perhaps because there were no susceptible persons in the house.

Patients on their return home are enquired after by a sanitary inspector; one inspector's special duty being to look after cases of infectious disease.

Rules for Patients.

Patients are admitted only on the order of the medical officer of health. No patient is allowed to leave the hospital without the discharge of the medical officer of health, whose instructions must be carefully obeyed. The hospital ambulance is sent free of charge, with a nurse in attendance to remove patients from their homes to the hospital.

Clothing to be brought with Ambulance:—Night dresses and slippers.

Patients must obey the directions of the matron or nurse in charge, and any case of insubordination, or the use of bad language, or of ill behaviour, shall be reported to the medical officer.

Patients shall not send letters to friends outside the hospital, nor give anything to or receive any food or articles from visitors, except by permission of the matron.

Patients are to keep within the prescribed bounds when taking outdoor exercise, and not mingle with convalescents from other diseases.

Patients are not to go into the other wards or into the ward kitchens without leave from the matron.

All patients' linen sent to hospital must be properly marked; no responsibility can be accepted for the loss of any articles not so marked.

Smoking is prohibited in any of the hospital buildings.

Patients may be attended by their own doctor if notice be given on admission, and if so attended are expected to pay such attendant his usual

charges, and to pay also for medicines, stimulants, and extra articles of diet supplied, and for any special medical attendance. Such patients are subject to the same rules as to conduct as the other patients.

Rules for Visitors.

Except in extreme cases, only *one person* is permitted to visit a patient in the hospital, the visits to be twice in each week, *limited in duration to a quarter of an hour*, and to be restricted to a parent or guardian, or intimate friend of the sick patient.

Visiting of patients inside the wards is to be limited to cases which are dangerously ill, and will not be permitted without the sanction of the medical officer. In urgent and special cases, however, the medical officer is empowered to increase the number of visitors to two, and the duration of the visit.

Visitors are strongly urged not to enter any public conveyance immediately after leaving the hospital.

Visiting Days.—Thursday and Saturday, between the hours of 2.0 and 4.0 p.m.

Information as to the condition of any patient may be obtained every week-day, at 10 o'clock, at the Sanitary Office, Guildhall.

In cases dangerously ill, notice will be sent to parents or guardians.

No dogs will be allowed at the hospital.

(By Order),
W. M. Hope, D.P.H.,
Medical Officer of Health.

Convalescence after Fever.

To Parents, Guardians and Others.

Although every endeavour is made to send out patients free from infection, it is advisable, as an additional precaution, that they should, as far as possible, be kept away from other children for the first two weeks, after their return home. They should certainly not sleep in the same bed, and, if possible, not in the same room with children who have not had the disease.

It is also advisable that articles used by the patients, such as cups, plates, spoons, handkerchiefs, towels and toys, should during this period be kept distinct from those used by other children.

The above precautions are specially important in the case of those patients suffering from discharge from either nose or ears.

All persons recovering from fever should be warmly clothed, and otherwise protected against cold. Any recently discharged person who complains of sore throat, nose, or ear, or who has a breaking out on the skin, should be at once isolated, and placed under the care of a medical man.

Kissing should be avoided, as it is in the cavities of the mouth, throat, and nose that infection may exist which it has not been possible to detect.

Children convalescent from scarlet fever must not return to school for two weeks after being discharged from hospital, and those convalescent from diphtheria not until four weeks after being discharged from hospital.

9.—Huddersfield Sanatorium.

This establishment, which is the hospital for infectious diseases for the County Borough of Huddersfield, was visited by me on June, 1909, in company with Dr. S. G. Moore, medical officer of

health. The hospital was not erected under the sanction of the Local Government Board having been constructed by means of loans authorised by Local Acts.

It was opened on October 22nd, 1898.

A full description of the hospital, illustrated by plans, was given by the then medical officer of health, Dr. Annis, in his annual report for 1898, from which the following account is taken.

The site of the hospital is about two miles from the centre of the town, in a direct line, and has an area of about 18 acres in extent. It is somewhat of a triangular shape, with the apex pointing about due north, and is bounded by good roads on two sides. Entering the grounds by the main entrance, one finds immediately on the left-hand side a substantial porter's lodge, containing an office, which has telephonic communication with the rest of the hospital buildings, and large living room and kitchen, with bedrooms above for the porter. The grounds on the left and to the rear of the porter's lodge are lying entirely open, thus obtaining a very pleasant outlook from the front of the administration buildings. On the inner side of the wall, separating the grounds from the public roadway, a belting of shrubs has been planted. The administration block is built in renaissance style, and has a very good appearance. The main entrance is in the centre, and opens directly into a fine entrance hall with terrazzo pavement. On the right-hand side are the matron's rooms and office, and to the left-hand the medical officer's rooms with the committee room, the nurses' dining and sitting rooms being right and left at the back. The first floor, containing 19 bedrooms, linen closet, lavatories and bath-rooms, is arranged for nurses, the second floor having the same number of rooms and accommodation for servants. Passing along the main entrance on the right and left are placed the kitchen, scullery, and the store rooms respectively. The administration block is connected by means of covered ways with the whole extent of the premises to the laundry block, with branching covered ways to each pavilion. These covered ways are not entirely enclosed, having an open space at the side below of about 6 inches and 2 feet at the top, with 5 feet 6 inches screen at the side, thus enabling one to have the advantage of shelter in inclement weather, and yet being not entirely enclosed. Passing still further along this main covered way, we come immediately on the right to the receiving block, and on the left to the discharge block, containing respectively the store room, bath room, patients' receiving room, and friends' waiting room. We next come to the branching corridor, which leads to the first pavilion.

The pavilions are built in a rectangular form, and are entered at the centre. Their axes run almost directly N.N.E. by S.S.W., thus allowing the sunshine to reach to the fullest extent to all the walls and foundations—the early morning sun reaching the south-eastern side windows, whilst the late afternoon sun just reaches the opposite side walls. There is a distance of 71 feet between the pavilions, and 85 feet from the end of the pavilion to the boundary of the grounds. Between the pavilions the ground is asphalted and laid out as a playground for the patients. At the extreme end of the covered way is the laundry block, which is divided into two portions—one for the patients, one for the staff—and containing in each clean clothes delivering room, ironing room, drying room, and laundry, and underneath these buildings are the coal cellars and the boiler house. The disinfector is placed at the rear of this block and entirely distinct from the same. The mortuary block is built at the north side of the laundry block, and also is entirely distinct.

It should be borne in mind that the several departments—*i.e.*, disinfector, boilers and engine, laundry, mortuary, kitchen, stores, and accommodation for nursing staff and servants—are adequate for dealing with all the requirements both of patients and increased staff whenever it may be found necessary to complete the scheme of the whole

hospital by building the other two portions, as shown on the sketch plan herein, when the number of beds thus provided would be about as many again as at present.

Administration Block.—On either hand, right and left, are the office and committee rooms respectively; these are furnished in a simple style indicative of the purpose for which they are required. The matron and medical officer's sitting rooms, on the right and left-hand sides respectively of the main entrance, are large airy rooms with bay windows, having a splendid outlook on to the whole of the open part of the grounds. They are furnished in walnut, upholstered in hair and leather cloth. The matron's bedroom is at the back, looking towards the pavilion; the medical officer's bedroom being on the front on the ground floor. Adjoining the matron's sitting room is the small sewing room, which will be used for the various processes of repairing and renewing the household linen required. This has a stained and varnished floor, and is simply furnished with table and chairs and a useful sewing-machine. At the opposite end of the cross corridors will be found the dispensary, fitted up with various dispensing bottles, having indelible labels affixed to the same, and the various requisites for supplying the medical needs of the patients contained therein. Adjoining this is a small waiting room in which the nurses will be able to wait while their respective supplies of medicaments are being prepared. Passing through the folding doors, we arrive at the nurses' sitting and dining rooms, which are thus somewhat cut off from the front portion by these folding doors. On the first floor are the nurses' bedrooms; on the second floor the servants' bedrooms, with separate lavatory accommodation for each.

Kitchen and Scullery.—The kitchen is fitted up with every modern appliance, having large fire range with baker's oven, steam-heated closet and carving table, gas stove, and two beef tea extractors, and is lighted by means of a large central glass-covered lantern with side windows. The scullery adjoining contains a steam vegetable cooking apparatus, and also two steam jacketed pans for milk, &c. The steam is supplied direct from the boiler house by pipes laid the whole length of the main corridors, giving off branches whenever required. The kitchen has been fitted and arranged to cook for 200 persons.

Receiving Block.—This block is the first building reached on passing along the corridor on the right-hand side. Patients on being brought to the hospital will be brought in the ambulance to the door at the far side of this building, and there received under a glass-covered verandah into the receiving room, where any friends who have come with them will be able to take a last adieu for the time being. The patient will then be passed into the bath room, and thence being enwrapped in warm blankets, and having been placed on a wheeled stretcher, will be wheeled to the bed provided in the ward for this patient. There is also a clothes' store and friends' waiting room provided in this block.

Discharge Block.—This block is immediately opposite the receiving block, but is not connected with the corridors by means of any covered way, thus endeavouring to eliminate the possibility of discharging any infectious germs along with the patient. It is fitted up in a similar way to the receiving block, except that the process will be gone through in the reverse order.

Ward Pavilions.—There are at present three pavilions erected on the south side of the main covered way. One isolation block is being erected on the north side, leaving for the completion of the whole design the erection of two other pavilions on the north side in positions corresponding with those on the south side. Each pavilion is one storey in height, and is built on pillars, thus allowing a free circulation of air around and underneath the whole of the building. They are constructed on the same general plan, and to accommodate 14 patients in each half, with a small ward for two other patients. The only difference between the three pavilions is that in the first there is a wall sub-dividing the large wards into two of unequal size—one to accommodate ten patients, and the smaller room four patients. In the centre of the pavilion we find the entrance to the same from the covered way opening out into a large hall. On the right and left of it

are clothes stores and pantry respectively, immediately opposite being the ward kitchen fitted up with all the necessary appliances, having a gas stove for whatever cooking purposes may be required, and having three fixed windows allowing complete observation of the whole of the wards. The wards are arranged so that the beds can be placed between alternate windows, having a ventilator opening immediately beneath the bed, with radiator on each side at either end. There are also large ventilating stoves placed centrally, and open fire-grates at the end. A small ward for two beds opens out of one of these larger wards, and has a separate means of exit at its further side into the hospital grounds, and also separate lavatory accommodation, thus allowing it to be used at any time entirely distinct from the other wards. Covered hot-water pipes run the whole length of each ward below the floor, and communicate with the radiators within the ward, behind each of which is placed a ventilator for the admission of fresh external air. Further ventilation is provided by means of a fan in one of the side walls of each large ward, driven by a small electric motor, and also by Boyle's exhaust flues through the roof. The wards, and in fact the whole of the buildings, are lighted throughout with electric light.

The size of the wards is as follows:—

Cubic capacity, 26 feet by 89 feet by 13 feet = 30,082 = 2,150 cubic feet per bed.

Floor space, 26 feet by 89 feet = 2,314 = 165 square feet per bed.

Linear wall space, 26 feet by 89 feet = 8 feet per bed.

The window area in all cases is equal to one quarter of the wall space. The walls and ceilings are in Keene's cement, painted four times and twice varnished, giving a beautiful smooth surface to the whole. The floors are fireproof, and are covered with polished teak, laid diagonally. All the corners and angles in the wards are rounded off to allow as little surface for the lodgment of dust and other particles as possible.

The whole of the pipes, electric wires, and various flushing cisterns are placed in the false roof, which is made accessible from outside the pavilion. The windows are glazed with two large plates of $\frac{1}{4}$-inch plate glass, one in each sash upper and lower, and made on the N.A.P. principle, so that both sides of the window can be readily cleaned from the outside of the building, as the sashes are made to swing round on a central point. The thickness of glazing also tends to assist in keeping the temperature of wards more equable.

The walls of the sanitary blocks and ward kitchens are lined with glazed bricks, and the floors are also of terrazzo, so that the whole can be thoroughly cleaned by hosepipe if desired.

The ward lavatories are placed in annexes about two-thirds of the way along the north-west sides of the pavilions towards the end, thus allowing easy access from any part of the ward. Each annex is separated from the general ward by a warmed and cross-ventilated corridor, which in the first pavilion has a separate door into the small four-bed ward, as well as one into the larger ward, and is divided into four portions—*i.e.*, two separate w.c.'s, one room containing four lavatory basins, fixed bath and room to stand a movable bath, and one room containing sink for flushing and scalding bed pans, draining boards, slop sink, and a small cupboard open by means of louvred ventilators to the external air, and closed to the room by means of a tight-fitting door, in which can be placed chamber utensils, &c., when a further inspection or examination of their contents is desired.

Steam heaters connected with the heating and ventilating arrangements are placed in the basement under each annex.

The ward furniture consists of Gale's iron bedsteads, all having rounded sides, corners and ends, fitted with Lawson Tate's spring mattresses. The patients' lockers are of pine, with birch Windsor chairs; cherry-wood arm chairs for children. The ward tables are of polished American maple.

Isolation Block.—The block in course of construction on the left-hand side of the covered way, and in a position corresponding to the first pavilion on the right-hand side, is divided into two distinct halves,

which halves are further sub-divided into two separate wards containing respectively three and two beds; each half is provided with a separate ward kitchen and all its appliances, and each separate ward is provided with distinct lavatory accommodation, so that any portion of this block can be used for any purpose entirely distinct from the remainder. This block is only connected with the main covered way by means of a foot walk, thus further emphasising the purpose for which it is intended, viz., for isolation purposes.

Laundry Block.—This building is erected at the extreme end of the covered way connecting the whole of the buildings, and is of very ample proportions, having all the modern appliances for facilitating the carrying on of the work necessary in such an institution, being capable of accommodating the washing for over 200 persons, and is divided into two portions—one for patients, one for the staff. The foul linen will be received at the extreme rooms right and left, and will be there placed in slate tanks for steeping purposes, from thence passed through the wash-house proper, which is provided with its various appliances for soap boiling, scrubbing, Summerscales' Triumph Injector washing machine, with automatic reversing gear, and a hydro extractor for assisting the drying process; from thence the goods will be taken to the steam-heated drying chamber, and will be placed upon the drying horses contained therein, viz., ten in the patients' department and six in the staff department; from thence they pass to the ironing and finishing room, and so on into the clean linen delivery room, which is fitted with sorting racks, baskets, &c. The floors are concrete throughout, delivering by means of channels on to trapped gullies outside the building; ample ventilation and light is also provided.

Mortuary.—This block is at the extreme back of the site, and will be reached from the outside for the purpose of any funerals by means of the back way into Albany Road, thus obviating the necessity for the hearse passing near any portion of the hospital premises proper. It comprises a shell room, post-mortem and bacteriological room, and a viewing room, which has a large glass panel through which the friends will be allowed to view the body, thus obviating any possibility of contact with the infected corpse.

Boilers and Engine.—The steam required for heating and disinfecting purposes, and the power required for driving the laundry and other machinery, is provided by means of two Cornish boilers, 18 feet by 5 feet, placed in the basement at the back of the laundry block, which also contains a Worthington pump capable of feeding the boilers, either directly or through the economisers. A small engine house with a horizontal six horse-power engine for driving the machinery is provided.

Disinfector Block.—The disinfector is of the approved Washington Lyons type, and is placed at the back of the laundry and boiler house. The machine itself is fitted in the usual way, having one end opening into one room which will be used as the infected side, whilst the other opens into another room entirely cut off from the former and used as the disinfected side. The disinfector is fitted with an automatic pressure and time gauge recorder, which will thus indicate the length of time and the amount of steam pressure used in the disinfection of any set of articles. Adjoining these rooms is a small store.

Covered Ways.—As has been frequently indicated above, the whole of the buildings inter-communicate by means of these partially enclosed covered ways, which are about 8 feet high, covered in for 5 feet 6 inches of their height, leaving 6 inches air way at the bottom and 2 feet at the top, roofed by means of corrugated iron. The floors are concrete, and underneath is a trench extending the whole way conveying the various steam, hot and cold water, and other pipes, so that any portion can be easily got at without disturbing the floor of this covered way.

Drainage.—The whole of the main drainage goes directly into the corporation sewer in Dalton Green Lane. All the w.c.'s are efficiently trapped, and the soil pipes carried outside the walls. Bath and lavatory wastes also discharge outside over properly trapped drains. The drains have all been tested with the hydraulic test, and are laid with good

gradients and straight lines between manholes, which have been placed at all points where change in the direction of the drain was required, thus providing for efficient inspection of the same. The rain-water from the roofs of the laundry and disinfector have been conveyed directly into the Lees Head Beck.

With regard to the general plan of the drainage, it may be said to be distinctly divided into two portions—one " infected " and the other " non-infected "—with separate entrances into the sewer. The latter drains the administration block, &c., and thence into a disconnecting manhole and on to the sewer. The former provides for the pavilions, laundry, &c., which also passes through a disconnecting chamber before it reaches the main sewer. The principle is that at the head of each main drain is a large automatic flushing cistern, which by its discharge will tend to keep the drains well cleansed.

No extension of the hospital has been made since 1898, the two projected pavilions on the north side of the corridor not having been erected. The medical officer claims that by disregarding desquamation as a sign of infectivity in scarlet fever cases he has enabled the mean duration of treatment to be reduced from 44·3 days to 29 days, thus obviating the need for extension.

The present number of beds is therefore 112 for infectious diseases, and eight for phthisis. The latter are in an old wooden pavilion which was erected on the site as a provision for small-pox before the permanent hospital was built. Into this phthisis ward eight young males, suitable cases, are received for training and treatment.

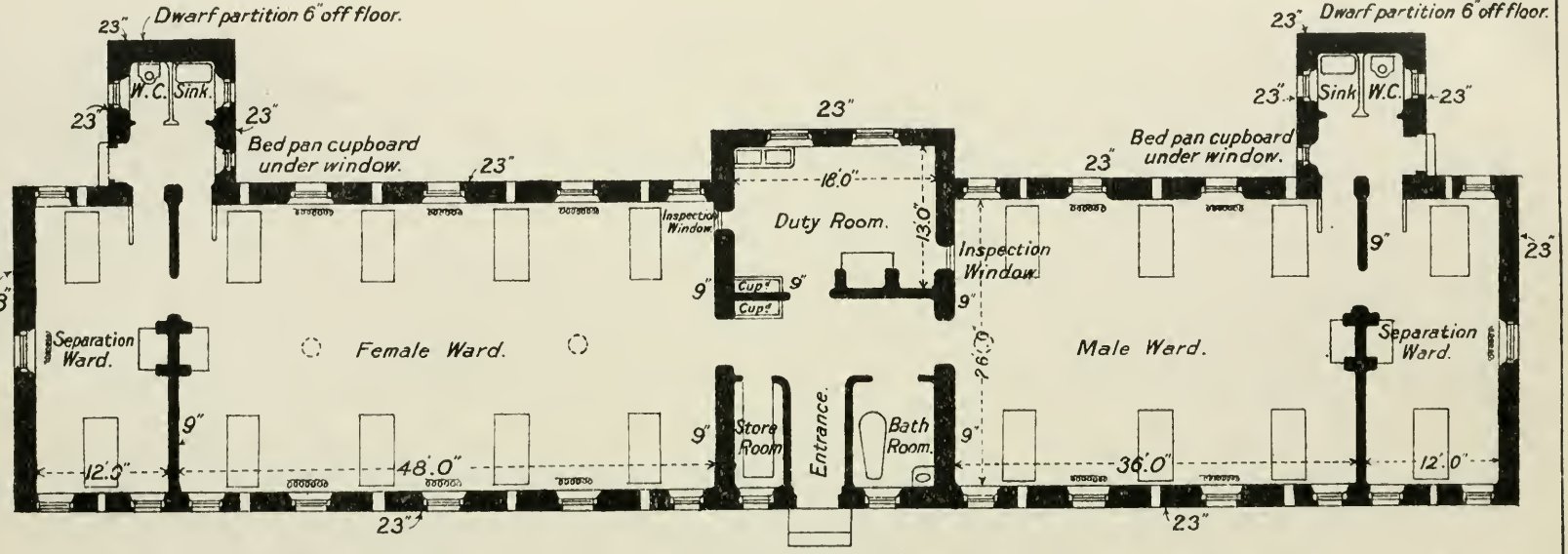
The cost of the site was £4,635, and of the permanent hospital £49,736. The cost per bed was therefore £444, or inclusive of site, £485. This is not a low rate for a hospital of this size, and the construction of the hospital so far from being simpler and cheaper than one erected under the Board's sanction is in several respects more elaborate than they would probably have approved. Thus the administration block has a mosaic floor and oak panelling; the wardblocks are raised upon arches above the level of the ground—this construction having been adopted in view of supposed dampness of the site, the suitability of which had been the subject of much local controversy—and they are connected by raised causeways bearing covered corridors, partly enclosed at the sides.

Few cases of cross-infection have occurred though there is no probation ward. One case of diphtheria in the block contracted enteric fever, the supposed cause being an untrapped sink pipe connected with a channel which had been covered in and converted into a closed drain.

10.—Kirkburton Joint Hospital.

This hospital, which is situated at Kirkburton near Huddersfield, was visited on June 30th, 1909, in company with Dr. Kaye, county medical officer for the West Riding. It serves the Kirkburton Isolation Hospital District, a district comprising the 10 small urban districts of Kirkburton, Emley, Farnley Tyas, Flockton, Kirkheaton, Lepton, Shelley, Shepley, Skelmanthorpe, and Whitley Upper, with an aggregate population in 1911 of 20,789, the population of the individual districts varying from

KIRKBURTON JOINT ISOLATION HOSPITAL.



SCALE OF FEET

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3,817 to 479. The district was formed in 1899 by Order of the county council under the Isolation Hospitals Act, 1893, an appeal against the Order having been dismissed by the Local Government Board. Under the Order the contributions of the several districts to the common fund are apportioned upon the mean of (*a*) the respective populations at the last census and (*b*) the rateable values. A loan of £9,696 for the erection of the hospital was sanctioned by the Board in 1904; this does not include the cost of the site, which had been purchased for £292 10*s*. out of current rates. The hospital had only been opened since November 28th, 1908.

The site is 4½ acres in extent, well situated on a hill, but the approach through an old quarry is somewhat steep. The Huddersfield water supply is laid on.

The hospital comprises the following buildings:—

1. A pavilion on a modification of the Board's plan C, containing 18 beds in an 8-bed, a 6-bed, and two 2-bed wards; the latter are formed by partitioning off the ends of the wardblock; the sanitary annexes being placed at the sides of the block with entrances through a lobby from both the main and separation wards—*see* plan.

2. An isolation block somewhat on the lines of the Board's plan B, having in each half a 2-bed and a 1-bed ward, total six beds. I found that the verandahs of this block had been completely enclosed with glass, the reason given being that during a recent outbreak of enteric fever, when both sides were occupied by cases of that disease it was not found convenient by the nurses to pass through the open air from ward to ward. The formation, however, of an enclosed aerial communication between all the wards will render them less suitable for separate use, for different diseases or for the segregation of a doubtful or mixed case.

3. An administration block, containing seven bedrooms; with discharging rooms for convalescent patients attached.

4. A laundry block, containing a steam disinfecting apparatus, ambulance shed, stable, and mortuary.

5. Porter's lodge.

The floors of the wards were of maple boards in narrow widths, but had not lasted well, owing to shrinking of the wood.

11.—Lydd Isolation Hospital.

The Borough of Lydd contains an area of 12,082 acres and a resident population (1911) of 2,874. Lydd itself is scarcely more than a village, but in the large outlying tract of marsh and shingle within the borough limits there are a military camp with, at times, a population of 4,000; coast-guard and other establishments; farms, &c. In 1909 there was a severe outbreak of scarlet fever, when temporary hospital accommodation had to be provided in an unoccupied school house and small villa, but this was not found satisfactory, and the town council decided to erect a permanent hospital. In view of the small size and resources of the district both the Board and the Kent County Council strongly advised combination with the two neighbouring authorities, viz., the New Romney Urban and

the Romney Marsh Rural District Councils, these bodies having already a joint temporary hospital, which it was thought could have been enlarged and made efficient at a less cost than establishing a separate hospital, but unfortunately local jealousies prevented this scheme being carried out. A separate hospital had therefore to be provided for Lydd, but in view of the local circumstances it was necessary to reduce the cost to the lowest possible point; and in conference at Whitehall a plan was suggested, on a modification of the plan A in the Board's hospital memorandum of 1888, and developed by Mr. Thurlow Finn, architect to the town council, in which the essential requirements of a very small isolation hospital were fairly well met in a single building. The town council had a freehold site available and suitable for the purpose, and they had also some furniture which had been purchased for the temporary hospital. On October 25th, 1909, the Board sanctioned loans amounting to £1,550, viz., £1,325 for building the hospital and £225 for furnishing, and the hospital was completed and opened in July, 1910.

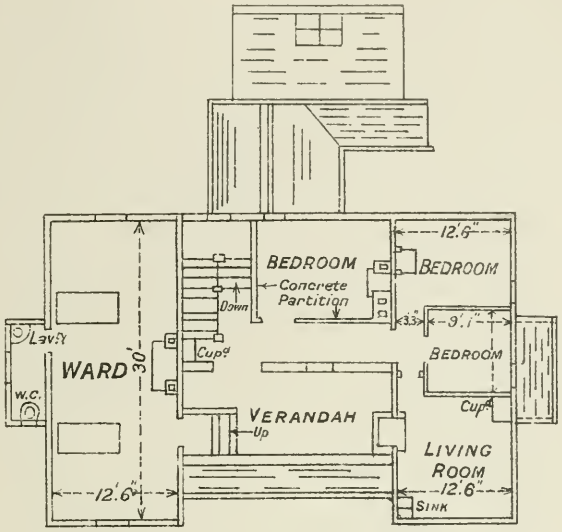
The hospital was visited by me on July 16th, 1911, in company with Mr. Oliver, medical officer of health, and Mr. Thurlow Finn, architect.

The site is half an acre in extent and is situated on the East Ripe, a very exposed open common, near the railway station. It is fenced in front by open iron railings and at the back and sides by wooden rails or a single line of barbed wire, which would be quite insufficient to prevent communications between persons within the enclosure and those outside. The Board's stipulation was for a gorse hedge between two rows of barbed wire. Water supply is laid on from the Littlestone Company's mains. Drainage is into a cesspool, which has an overflow into a soak-away in the sandy soil. It is stated that there is no water source in the neighbourhood which can be endangered by this method of disposal.

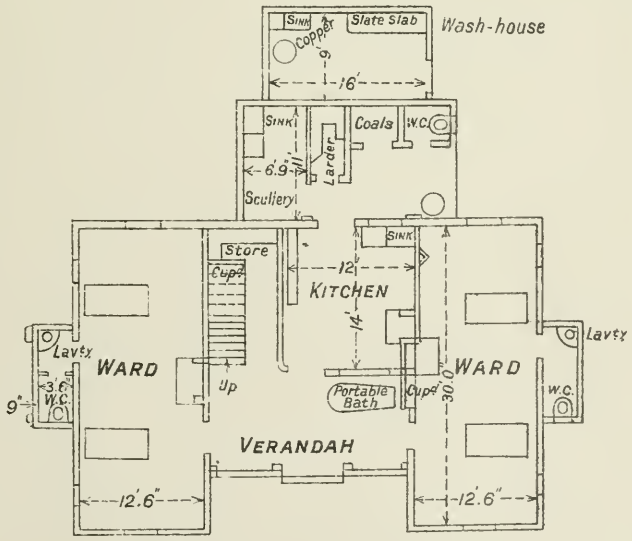
The hospital consists of a single two-storey building built of brick and covered with cement and rough-cast. On the ground floor are two wards measuring 30 feet long by 12 feet 6 inches wide and 11 feet high = 4,125 cubic feet with a kitchen between them. The wards were intended for two beds each, but I found four in each at the time of my visit. The wards and kitchen are entered from a verandah in the front of the building; this verandah was originally open in front, but it—and also that on the first floor—has since been enclosed by glass panels, which are made to open if desired. It was stated that the enclosing of the verandahs had been found necessary owing to the bleakness of the site, the S.W. wind coming off the sea and sweeping across the level marsh with great force. The water-closets are against the outer walls, being approached from the wards through lobbies which have corner, but not direct cross, ventilation. There are no separate slop sinks, the water-closets being constructed for use as such. The floors of the lobbies are of plain cement; those of the wards on the ground floor are of ebnerite, a red plastic material containing sawdust, which is rather slippery; at the time of my visit they were smooth and free from cracks. The

BOROUGH OF LYDD.

ISOLATION HOSPITAL.



FIRST FLOOR PLAN.



GROUND FLOOR PLAN.

10 5 0 10 20 30 40 FEET.

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walls are lined with a smooth cement (sirapite). The doors have a flat surface without mouldings or panels. Warming is by open grates of the Peveril pattern. A movable bath is kept in the verandah. On the first-floor there is one ward, approached from a verandah, which has been enclosed like that on the ground-floor. The ward is similar to those on the ground-floor, except that it has a boarded floor and is partly in the roof, the height being 9 feet 6 inches to the wall plate. There are also on this floor a nurse's bedroom and three rooms which are used by the caretakers.

Behind the block, separated from it by a covered lobby open at the sides, is an annexe containing a wash-house and a scullery. There is no mortuary. The town council have a steam disinfecting apparatus on another site $\frac{1}{4}$ mile distant. There is no ambulance.

The caretakers are a man and wife, who live there rent free when the hospital is without patients, the man working on the roads. When there are patients they receive £1 1*s.* a week and rations; the wife acting as nurse if the cases are of no great severity. A trained nurse is engaged when necessary. Since the hospital has been opened there have been two cases in it, one of scarlet fever at Christmas and one of diphtheria at Easter, 1911. A nurse was engaged for the diphtheria case. There was no further spread of either disease. The total cost of erecting the hospital was £1,309, including laying on water (some £80) and enclosing the verandahs (£30). Including furnishing the cost has been covered by the amount of loan £1,550, which for six beds is about £258 per bed without site.

The low cost is due to a suitable site being available; to the hospital being of a single building; and to the simple character of the equipment. Experience is as yet lacking to show whether a hospital designed and staffed as this can be safely used for more than one infectious disease at a time. Two wards might perhaps have sufficed.

(A hospital of similar design has been erected at Sedbergh, Yorkshire.)

12.—Newport, Monmouthshire.

Allt-yr-Yn Hospital.

Visited on March 18th, 1907, with Mr. Kitchin and Dr. Howard Jones, medical officer of health.

This hospital, opened July 20th, 1896, is situated in the western part of the borough of Newport about a mile from the town, in an elevated situation, commanding extensive views. The road to it is very steep. The area of the site is $5\frac{1}{4}$ acres. It is fenced with a stone wall. The borough sewers, water service, and electric supply are available. The site cost £2,689, including a disused board school and schoolmaster's house which stood on it. Of these the latter is used for the resident engineer, while the school room has been converted into a laundry block.

The hospital buildings comprise—

1. Administration block, with laundry for staff.

2-3. Two pavilions on the Board's plan C each containing two 6-bed wards. One of these blocks is used for diphtheria and the other for convalescent scarlet fever cases.

4. A block on the lines of the Board's plan B containing in each half two 2-bed wards. In this block one pair of wards is used for enteric fever cases and the other pair as isolation wards. The wards of one pair have no direct connection with those of the other pair, but the verandah on each side has been enclosed by a glazed screen so as to convert it into a kind of corridor, in which at the time of our visit patients were lying. These screens can be opened like French windows, but when they are closed the verandah forms an unventilated space into which the w.c. opens and which contains the gully over which the sink pipe from the nurse's duty room discharges. The enclosing of the verandah also somewhat interferes with the access of light and air to the wards and nurse's duty room.

5. The new scarlet fever pavilion erected by means of loan sanctioned in 1898. This was erected nominally for 22 beds, viz., with two 10-bed wards and two single-bed wards; but at the time of our visit it contained 32 beds and cots, most of the patients however being children. One of the single-bed wards was in use for a scarlet fever patient who had ringworm, and other cases of scarlet fever complicated respectively with diphtheria and with measles were being treated separately in the isolation block, No. 4. The ground on which this block, No. 5, is erected is sloping; so that a space is left under the main wards, and a chamber under each of the single-bed wards; the latter spaces are utilised for boilers, one for heating purposes, the other for supplying hot water. In front of this block and connected with it by a cross-ventilated passage, is an annexe containing discharging rooms, &c.

6. Mortuary, with viewing lobby and post-mortem room.

7. The laundry block, which, as already stated, is an old school room converted to this use, contains wash-house with steam machinery, drying closet, ironing rooms, disinfecting rooms with Lyon's apparatus, boiler, and engine house.

The administration block as originally constructed contained 12 bedrooms; but it was enlarged at the extension in 1898, when 19 more bedrooms were added. Before the extension it is said to have been too small for the needs of the hospital (then containing 32 beds), and nurses and ward-maids had to sleep two in a room, but at the present time some of the bedrooms are not required as such under ordinary circumstances, but are utilised for other purposes.

On the scale of 2,000 cubic feet of space per bed the hospital, as enlarged, affords space for 54 beds, but this number is sometimes exceeded and as many as 82 patients have been in the hospital at one time.

There is no porter's lodge at this hospital, and the need for one has not been felt; there is a man resident at the laundry block.

The Allt-yr-yn hospital is not used for small-pox, for which disease the old port sanitary hospital is now reserved; but other port cases (chiefly enteric fever) are treated at Allt-yr-yn. Patients from the borough are admitted free into the general

wards, but a charge of £3 3*s*. a week is made for the use of a single-bed ward. Cases are also received from neighbouring districts at a charge of £2 2*s*. per week and from the guardians at 25*s*. per week.

The average annual number of cases received since the opening of the hospital up to the date of our visit had been about as follows: scarlet fever, 182; diphtheria, 58; and enteric fever, 20.

The average stay in hospital of patients who recover had been 43·8 days for scarlet fever cases, 33·2 days for diphtheria, 42·7 days for enteric fever.

Dr. Howard Jones, medical officer of health for the borough, acts as medical superintendent and medical attendant, but patients may if they wish be attended by their own medical men.

The following table taken from the annual reports of the medical officer of health shows the proportion of cases of scarlet fever, enteric fever, and diphtheria removed to hospital in each year since its opening in 1896:—

Percentage of Notified cases removed to Hospital, 1896 *to* 1905.

Year.	Total of Notified Cases removed to Hospital.	Scarlet Fever.		Typhoid Fever.		Diphtheria and Membranous Croup.			
		Notifications.	Percentage of removals.	Notifications.	Percentage of removals.	Notifications.	Percentage of removals.	Fatality per cent. Hospital cases.	Fatality per cent. of Home Nursed Cases.
1896	132 (6 mths.)	450	24·2	51	29·4	*43	18·1	—	—
1897	191	192	73·4	57	63·1	*25	12·0	66·6 (3 cases)	22·7
1898	149	71	71·8	38	67·5	*112	57·1	12·5	54·1
1899	132	46	69·5	73	89·0	*33	78·7	26·9	100·0
1900	265	258	61·1	53	73·5	120	58·0	3·0	14·5
1901	345	382	57·3	75	85·3	181	34·2	5·0	13·0
1902	304	371	56·8	44	65·9	145	43·4	3·2	5·1
1903	261	268	76·4	33	66·6	78	44·7	2·4†	18·6
1904	288	259	84·1	21	71·4	92	59·7	1·7	19·4
1905	212	136	86·0	24	79·1	110	69·0	2·5	26·4
1906	388	264	84·0	38	86·8	170	78·2	3·7	18·9
1907	459	572	66·0	21	80·9	103	56·3	10·3	17·7
1908	388	437	69·7	47	78·7	80	57·5	15·2	23·5
1909	341	365	73·1	25	80·0	89	58·4	11·5	13·5
1910	313	293	77·4	27	77·7	103	62·1	6·2	12·8

* Excluding Membranous Croup.
† 1 death from outside Borough.

The hospital was erected by means of a loan of £12,000 sanctioned by the Board in 1894; this included £2,578 for the site. A further loan of £2,000 in 1897 was, however, needed for the completion and furnishing of the hospital. The hospital as at first erected contained 32 beds, and cost, therefore, £14,000 = £437 per bed, or £357 excluding the cost of site.

The extension completed in 1903 added 22 beds, at a cost of £7,500; making the total cost £21,500 or £398 per bed with site, and £350 excluding site.

In 1904 an additional loan of £2,140 for excess expenditure incurred in connection with the hospital was sanctioned by the Board, raising the total cost to £23,640 or £438 per bed with site, and £390 excluding site.

But in addition to the loans which have been sanctioned by the Board the cost of the hospital appears to have been partly defrayed out of current revenue, as the total capital expenditure is given as £23,831 5*s.* 1*d.*, equal to £441 per bed.

The following are directions in which it appeared to us that expense might have been saved in the erection of this hospital.

The site in addition to its somewhat high cost per acre was an expensive one for building purposes, owing to the steep gradient of the land and to its elevated position above the town. In view of the hilly character of the district it is doubtful whether a cheaper one for building purposes could have been obtained.

A corrugated iron fence or close wooden paling would have been cheaper than the stone wall with which the site has been enclosed.

The staff laundry is never used and might well have been omitted. We were told that it had been provided at the Board's instance, but this, so far as we can learn, is a mistake.

The enclosing of the verandahs of the isolation block, which cost £150, appears to us to have been unnecessary and open to objection as already mentioned.

The arched space under the new scarlet fever pavilion has been found objectionable as the wind through it cools the hot water pipes which traverse it, and the arches have now been bricked up. The sanitary annexes in this pavilion are also larger than necessary.

The two projections to the new pavilion containing the 1-bed wards, tank rooms, and boilers are unnecessarily elaborate. The brass fittings and fixtures, sinks, closets, &c. in this block are of a somewhat expensive kind. Teak and terrazzo floors though durable and satisfactory are somewhat costly. There is an unnecessary amount of woodwork in ordinary skirtings, &c. in the new pavilion.

The discharging rooms at the entrance to the new pavilion, which are used exclusively for scarlet fever discharges, have also tended to raise the cost of this block. Expensive fireplaces and chimney pieces have been put into the separation wards in addition to radiators. Large central stoves have been provided in the main wards as well as radiators.

The following are alleged deficiencies in the hospital.

The sanitary annexes in the older pavilions are stated to be inconveniently small. The supply of hot water in these pavilions is insufficient when several baths have to be given; it is furnished from a cylinder, the water being heated by a boiler behind the fireplace in the nurse's duty room.

Trouble has been experienced from the frequent bursting of the leaden cold water pipes supplying the baths. This appears to be due to the sudden cutting off of the flow of water by the action of the four-way cocks with which the baths are fitted; this causes a backward shock, as in a water ram, which distends and ultimately bursts the pipes.

The woodwork of the hospital has not proved satisfactory; the deal floors of the older wards have worn badly, and cracks have opened in the frames of doors and windows.

In the older pavilions the walls, which are solid, have proved damp at times; hence those of the new block have been built hollow.

The central ward stoves with descending flues have also given trouble through deficiency of draught owing to insufficient height of the chimneys.

13.—Nottingham.

Bagthorpe Hospital.

This hospital was visited on March 28th, 1911, in company with Dr. Boobbyer, medical officer of health, and Dr. Kentish Wright, resident medical officer.

The site of this hospital is on the Hucknall Road, two or three miles to the north of the centre of Nottingham; it stands high on a dry red sandstone soil, and is 12½ acres in extent. The permanent buildings were erected by means of a loan of £22,062 authorised by a Local Act in 1883 and were completed in 1891. Since that date some improvements and additions have been made partly by means of loans of £7,888 sanctioned by the Local Government Board in 1893 and partly out of current revenue, *e.g.*, the substitution of two large Lancashire boilers for one small Cornish boiler, the construction of a railway siding into the hospital enclosure, and the erection of a shelter for friends of patients near the main entrance; and the cost of the whole permanent hospital capable of accommodating some 112 patients with an allowance of 2,000 cubic feet per head, including the above additions and the fencing of the site, is stated to have been about £32,000.

There are also on the site some farm buildings which have been adapted for hospital purposes, and some temporary wardblocks of wood and corrugated iron, which were allowed to remain when the permanent hospital was built. The farm buildings and the iron wards are now used as a sanatorium for phthisis patients. The entire hospital is now considered capable of accommodating about 150 patients without crowding.

The permanent buildings are of brick, and the wardblocks are connected together and with the administrative block by long enclosed brick-built corridors or covered ways about six feet wide. These corridors have windows on each side, and near the entrance to the wardblocks the walls are interrupted by an opening—covered only by the roof—for setting down patients from the ambulance.

Three of the wardblocks are on the lines of the Board's plan C, having two large wards and two single-bed wards. The windows in the small wards are not conveniently placed, and the projection of these wards on either side of the nurse's duty room somewhat interferes with the lighting of the latter.

The fourth block is called the "isolation block," but was not designed upon the principles of the Board's more recent plan B. It has a long corridor under the main roof of the building and which was originally entirely enclosed; on one side of this corridor there is, in the centre of the block, a single large duty room, and on either side of this there are two 3-bed wards, four in all, and at the ends of the block are two larger 5-bed wards. All these open into the common atmosphere of the corridor, and the smaller wards had originally no direct through ventilation. On the other side of the corridor are annexed the water-closets and bath-rooms, and the corridor, as originally constructed, was lighted by windows in the spaces between the annexes. Owing to the frequency with which cross-infection occurred in this block it has been altered by removing the outer wall of the corridor between the annexes, and covering the spaces between the annexes by a glass roof so as to convert them into verandahs open in front.

The walls in the permanent blocks have internally a dado of coloured glazed bricks; the floors in the lobbies are of mosaic (terrazzo), and in the wards, of boards stained and varnished. The buildings are warmed by steam from the boilers at the laundry-block, but this is said not to answer very well, as the boilers being at a higher level than the wardblocks, the steam does not circulate readily, and at my visit there was little warmth in the radiators. The steam pipes are taken to the wardblocks in trenches under the connecting corridors, and escaping steam coming in contact with the walls of the corridors above the damp course has saturated and discoloured them. Several of the baths in the wardblocks are on wheels, so as to be capable of being moved into the wards, but they are hardly ever so used, it being found more convenient to use them in the bath-rooms. Water for the baths is supplied from cylinders in the nurses' duty rooms, the water being heated in a boiler behind the fireplace; this having been found insufficient, steam coils have been placed in the hot water cylinders; but even now the supply of hot water is scarcely enough for the number of baths required. Owing, however, to the system of treating patients in the corridors, the bath accommodation has to serve for considerably more patients than the number for which it was provided.

Of the temporary buildings, one is a wooden tarred weatherboarded block, containing two 12-bed wards. The central portion containing the chimney flues is of brick, and there are also brick chimney flues at the farther ends of the wards. This block, which was erected in 1885, is now in bad condition; the weatherboarding is in disrepair; the floors are shaky; the match-boarded lining is dirty and the plaster ceilings are in places decayed. In each ward gas stoves without flues have been placed in the centre in addition to the fireplace at each end.

Near this block is a concrete platform formerly occupied by a Doecker wardblock of wood and canvas; this block was completely destroyed in a violent S.W. gale in March, 1894, the whole building with a stove weighing 3 cwt. being blown away into a field some hundred yards distant.

The two iron pavilions were erected in 1894 for small-pox cases: each consists only of a single ward for 10 or 12 beds. The two pavilions are placed end to end with an intervening space of some 10 or 12 feet, which has since been enclosed and divided into two rooms so as to form a dressing room for each ward. There are two iron stoves in each ward. On the S.E. side, the windows originally opened only by hopper lights in the upper third, the lower two-thirds of each window being fixed, but the glass in the lower part of each alternate window has now been removed and wooden shutters substituted for use in stormy weather. On the N.W. side the windows have been cut down to the floor level so as to form doorways, which are furnished with sliding doors. On this side a verandah ten feet in depth and open in front has been erected, it has a concrete floor which extends beyond the front of the verandah, and might be made to extend further if it were desired to place beds wholly in the open air. The corrugated iron required painting on the outside, and the board floor was much worn; otherwise these blocks appeared in fair condition.

One of the farm buildings, which was originally a shed, has been adapted in a similar manner for the purpose of open air treatment. The windows on the N.W. side have been cut down to the floor and furnished with sliding doors, and they communicate with a verandah ten feet wide. On the S.E. side the lower part of the window below the hopper light has been made to swing back on hinges into the ward, so that the windows can be made to open practically to their whole extent, whereas of a sash window only half can be open at any one time.

The diseases treated in this hospital at the present time are for the most part scarlet fever, diphtheria, and phthisis. Enteric fever cases are for the time being sent to the General Hospital, and for small-pox the corporation have now a separate hospital two miles distant at Bulwell Forest.

The above-mentioned alterations to the iron pavilions, the farm shed, and in part to the isolation block, as well as the use of beds in the corridors, have been effected with a view to carrying out the treatment of patients under conditions approaching as nearly as practicable to the open air. This treatment is adopted not only for cases of phthisis, but also to some extent for cases of scarlet fever, diphtheria, and other diseases, and, it is claimed, not only without hardship or injury to the patients but also with advantage to their prospects of recovery. It also enables a larger number of patients to be treated in the wards. Dr. Boobbyer gives me the following notes on his experience of the system:—

> "Owing to the obvious disadvantages attendant upon the aggregation of patients suffering from all types of acute specific disease (especially scarlet fever) at various stages in large common wards at the same time, and the public attention which this subject attracted

during the last decade of the last century, I was at much pains from the time of my appointment in Nottingham (1889) onwards, to devise some means of overcoming this serious drawback to hospital isolation, a drawback, be it noted, exerting an injurious influence upon staff and patients alike.

" Without mentioning particular diseases, or discussing the subject in detail, I may point out, by way of illustration, that cases accompanied by cough, by discharges from the mouth, nose, ears and other orifices of the body, by specific rash with exudation and exfoliation, and by cutaneous suppuration, must be continually discharging a large amount of infective material into the atmosphere around them in the form of moist spray or dust.

" At the outset, attempts were made to separate the cases according to type or stage of the ailment, but this was soon found to be impracticable in a small hospital (like ours) in full use, and also unsatisfactory, *e.g.*, in order to carry out this practice it would often be necessary to leave certain wards almost empty, at a time when there was much demand on the available space in the hospital, and it would be obviously as bad for acute cases to poison each other, as that they should be allowed to poison the milder and convalescent cases.

" Schemes for providing small separate wards for each case were considered and abandoned as impracticable. Ultimately I endeavoured, and with success, to augment the ventilation of the wards by open windows, and the advantage of this innovation was at once apparent in the improved health of the staff and patients. Finding at length that this free ventilation was well borne by even the most acute and severe cases, and finding also that even free ventilation did not altogether do away with cross-infection in our isolation block and elsewhere, I began, about 1895, to nurse acute and severe cases of scarlet fever and small-pox in the open air, and since about 1899 this practice has been regularly followed, and with excellent results.

" At Bagthorpe isolation hospital, the covered but freely ventilated corridors connecting the several sections of the hospital, and the roofed approaches to the ward-blocks have been used for this purpose; at the small-pox hospital, tents and other temporary structures.

" Cases of small-pox, scarlet fever, measles, whooping cough, pneumonia, erysipelas, and even enteric fever have been nursed under these open-air conditions, without untoward result in any single instance. Speaking generally, septic cases clear up much more speedily under such conditions than when confined to the wards. Neither pneumonia nor bronchitis has developed in any instance, and even nephritis cases have improved more rapidly than when nursed inside the wards.

" During the 1902-1904 outbreak of small-pox, all the more severe cases were nursed in bell-tents with raised curtains and open doors, in winter and summer alike. As in the case of other diseases, so with small-pox; there was absolutely no untoward result from exposure, and the cases undoubtedly cleared up more rapidly under the open-air conditions than within the wards.

" In 1901, owing to the success which had attended our long continued experiment with open-air treatment for all classes of cases, and the disquieting frequency of cross infection among the cases of different diseases nursed in our isolation block, and of hospital throats among the staff, I advised the health committee to convert the latter block into an open-air pavilion, with external verandahs. This advice was followed in 1903, and cross-infection in this ward-block has been almost unknown since that date. When the conversion was first carried out, the sisters and nurses of the hospital protested strongly against the exposure involved (to the staff) in nursing a pavilion under these conditions, and assured me that no nurses would undertake the duty in winter time. This prediction has been entirely falsified by subsequent experience, for there is now no section of the hospital so popular with the nurses as the isolation block. I should perhaps

explain that sail-cloth curtains are used to protect the verandahs in very bad weather, as with high wind, driving rain and snow, the latter could not be occupied without such protection.

"When patients are first brought under these open-air conditions, it is, of course, desirable to provide them with plenty of covering in the shape of blankets, and if there be much wind to fasten the bed coverings to the bedstead, and, further, in many instances, at the outset at any rate, to warm the beds with hot bottles; but one of the most remarkable circumstances connected with the treatment is the ease and rapidity with which all sorts of patients, and especially the young, establish a complete tolerance of open-air conditions at all seasons of the year. Patients, moreover, nursed outside during the acute stage of their attack, and then taken inside, frequently complain that the internal atmosphere appears close and oppressive, and depressing to their vitality and their spirits.

"Statistics cannot be very reliably used to demonstrate the comparative value of any particular line of treatment, owing principally to the well-known spontaneous variations in type common to all acute specific diseases, but when all the principal statistics bearing upon the subject trend in the same favourable direction, it is permissible to infer that some part of the improvement indicated by the figures is due to the new treatment. If we take the local case-mortality of scarlet fever in five-yearly periods from 1891 to 1910, we obtain the following series of death-rates:—3·1 per cent., 3·37 per cent., 1·62 per cent., and 1·94 per cent.; *i.e.*, during the past decade, in which open-air treatment has been very generally adopted, the case-mortality has on the average been little more than half the rate which obtained prior to such general adoption of open-air treatment.

"I am unable to give reliable statistics of such complications as nephritis and adenitis for years before the beginning of the twentieth century, but, whereas nephritis was given as occurring in 11 per cent. of the scarlet fever cases in the first four years of the past decade when fresh-air treatment was less extensively practised than later on, it is recorded as affecting only 3·7 per cent. in the last four years of this decade, when the treatment was being actively pushed. The same, with slight variations of the respective figures, may be said of adenitis.

"If it be argued that the recent decline in the fatality of scarlet fever, and in the prevalence of certain of its common complications which might have been expected to become aggravated by the exposure of their subjects in the open air, are due rather to spontaneous changes of type than to any special line of treatment, I agree at once, but I also contend that these figures must at the same time be held to indicate that the new treatment has increased neither the general mortality nor the ordinary complications of the disease. This brings me to my last point. The one thing needful in connection with a new departure of this character is to show that it does no harm. If this can be satisfactorily demonstrated, as I think it can, the rest is simple: It must almost necessarily follow that the fresh air will prove beneficial in confirming and hastening recovery.

"At the outset this treatment was adopted by us in a tentative manner, and the consent of patients or their friends was always obtained before it was adopted. After a few years, however, the obvious benefit of it in numerous instances, and the absence of any apparent drawbacks, led to its general popular approval in this neighbourhood, and at the present time, and indeed during the last 10 years, it is, and has been, a frequent experience for parents and guardians, or, in the case of adults, for the patients themselves, to ask for treatment in the open air instead of that in the closed wards." (March, 1911.)

The phthisis cases are not restricted to those in an early stage, but it is claimed that even advanced cases usually improve under the treatment and that in some instances a permanent arrest of the disease is effected.

At my visit to the hospital I found phthisis patients lying under the verandahs of the farm building and the iron pavilions; diphtheria patients lying in the verandahs of the isolation block, and scarlet fever patients lying in the corridors as described. In fine weather, I was informed, they lie quite in the open air. The day of my visit was fine but rather cold. The temperature in the permanent wards, of which the windows were wide open, was 50° to 53° F.; but there were no thermometers in the verandahs. The day before my visit there had been a violent gale from the N.E., very cold and with heavy rain, but I was informed that the phthisis patients had remained out all night in the verandahs. The ends of the verandahs were protected by screens of tarpauling or sail-cloth hung across them, and there were pieces of tarpauling over the feet of the beds to protect them from the driving rain, which, as marks on the floor showed, had penetrated three or four feet under the verandah. The patients, however, to whom I spoke did not complain of the cold, and I saw or heard of nothing inconsistent with Dr. Boobbyer's statements above. It was said, however, that patients used to warm rooms on first coming to the hospital felt the cold for the first three or four days, after which they got accustomed to it and did not mind it. In the meantime they were allowed to be near the fire if they wished.

It is well known that, given an adequate supply of food and water, with suitable clothing, the heat-regulating mechanism of the human body can gradually adjust itself to work at different ranges of external temperature. After a spell of hot summer weather we shiver if the thermometer goes down to 60° F., whereas in winter we perspire if it rises to 50°. Arctic voyagers have spoken of a feeling of warmth when the thermometer rose to zero, Fahrenheit, after the intense cold of the polar winter.

Scarlet Fever in Nottingham.

Year.	Cases.	Case rate per 1,000 population.	Deaths.	Death rate per 1,000 population.	Case mortality per 100 cases.	Percentage removed to hospital.	Cases per household invaded.
1882 ...	1,029	5·2	280	1·45	27·8	—	1·15
1883 ...	428	2·2	59	·29	13·8	—	1·2
1884 ...	384	1·8	37	·18	9·6	—	1·12
1885 ...	390	1·8	31	·14	7·7	12	1·2
1886 ...	351	1·6	13	·06	3·7	15	1·4
1887 ...	615	2·9	22	·10	3·6	45	1·4
1888 ...	643	3·0	25	·11	3·9	49	1·3
1889 ...	1,047	4·8	32	·13	3·2	71	1·2
1890 ...	984	4·7	33	·15	3·3	81	1·3
1891 ...	895	4·2	28	·13	3·2	86	1·39
1892 ...	1,163	5·4	43	·19	3·7	88	1·13
1893 ...	1,511	6·8	82	·37	5·4	70	1·2
1894 ...	1,164	5·3	51	·23	4·2	80	1·17
1895 ...	1,250	5·5	51	·23	4·1	93	1·3
1896 ...	731	3·2	27	·11	3·7	86	1·4
1897 ...	517	2·2	34	·15	6·6	90	1·2
1898 ...	931	3·9	32	·14	3·5	71	1·5

Year.	Cases.	Case rate per 1,000 population.	Deaths.	Death rate per 1,000 population.	Case mortality per 100 cases.	Percentage removed to hospital.	Cases per household invaded.
1899 ...	2,500	10·8	53	·23	2·0	47	1·2
1900 ...	1,394	5·8	55	·23	4·0	49	1·2
1901 ...	918	3·8	11	·05	1·2	47	1·1
1902 ...	966	4·0	23	·10	2·1	52	1·1
1903 ...	1,420	5·8	34	·14	2·4	34	1·2
1904 ...	1,189	4·8	27	·11	2·3	39	1·2
1905 ...	681	2·7	19	·07	2·8	56	1·35
1906 ...	611	2·4	17	·07	2·8	57	1·26
1907 ...	416	1·6	5	·02	1·20	69	1·2
1908 ...	595	2·3	11	·04	1·85	52	1·1
1909 ...	1,036	3·9	10	·04	·96	54	1·1
1910 ...	697	2·6	14	·06	2·0	60	1·3

The foregoing table, showing the course of scarlet fever since 1882, the year in which notification of cases of infectious disease became compulsory in Nottingham, is based on the annual reports of the medical officer of health, and, as regards deaths in the earlier years, on the annual summaries of the Registrar-General. 1882 was the last year of a formidable epidemic of scarlet fever in Nottingham, which had caused 180 deaths in 1879, 134 in 1880, and 353 in 1881, but this was followed, as major epidemics of infectious disease often are, by a period of comparative quiescence extending over several years. The high proportion of deaths to notified cases in 1882 and the next following years, however, probably shows that the notification of cases was at first very incomplete. In the later eighties the number of notifications began to rise, and has since remained at a higher level, with fluctuations at periods of a few years, reaching a maximum in 1899, and declining to a low point in 1907, since when it has risen again. The number of deaths, however, has never again approached anywhere near that in 1879-1882, and the death-rate from scarlet fever has, on the whole series of years, greatly declined, as has also the case mortality, the latter in 1909 having touched the lowest point on record.

Hospital isolation of scarlet fever commenced in a temporary hospital in 1885; it was at first practised only on a small scale, which however was gradually increased; its increase, therefore, coincided with the recrudescence of scarlet fever after the period of quiescence which followed the great epidemic of 1879-82. During the years 1889-98 a large proportion of the notified cases of scarlet fever—from 70 to 93 per cent.—were removed to hospital, but in 1898 the health committee instructed the medical officer of health not to remove cases from households of the well-to-do class, where there were means of isolation at home, unless in circumstances of special urgency, and the proportion of cases removed fell to about half the number notified. This change of practice coincided with a rise in the number of notified cases, culminating in the epidemic of 1899, but it would probably be as unsafe to say that the increased prevalence of scarlet fever in 1898-99 was due to the restriction of hospital isolation, as that

the increase after 1885 was due to its introduction. In years when scarlet fever cases have been numerous a smaller proportion have generally been removed to hospital than in years when cases have been fewer, probably owing to pressure on accommodation, as is stated to have been the case in 1893, when also it is stated that the early removal of cases to hospital was hindered by the same cause.

It does not appear from the table that the proportion of cases per household has been less in years when a large proportion of the cases was removed to hospital than in years when admission has been more restricted.

Scarlet Fever in Nottingham.

Year.	Percentage of notified cases removed to hospital.	Deaths per 100 cases.		Return cases per 100 discharged from hospital.
		Hospital.	Home.	
1892	88	3·0	8·6	4·0
1893	70	3·7	9·7	5·0
1894	80	2·7	10·4	4·5
1895	93	3·4	11·4	5·1
1896	86	3·96	8·0	2·3
1897	90	5·6	14·8	3·0
1898	71	3·5	3·8	3·4
1899	47	1·7	2·5	1·5
1900	49	3·9	4·0	3·2
1901	47	1·2	1·3	5·5
1902	52	1·61	3·2	3·68
1903	34	1·09	2·97	2·18
1904	39	1·90	2·5	3·48
1905	56	2·31	2·34	1·28
1906	57	2·64	3·1	1·17
1907	69	1·75	—	1·76
1908	52	3·25	1·6	2·27
1909	54	1·27	·64	2·56
1910	60	2·2	1·4	2·6

The above table is compiled from the annual reports of the medical officer of health. The case mortality has diminished considerably in the later as compared with the earlier years of the period, but less in the hospital-treated than in the home-treated cases; indeed, whereas in the earlier years of the period the proportion of deaths among the home-treated cases was much higher than among those removed to hospital, in the later years, on the contrary, the proportion of deaths is higher among the hospital cases. The high apparent mortality among home cases in the earlier years of the period is no doubt largely due to casual fluctuations; when nine cases out of ten were removed to hospital a few deaths more or less among the small residue remaining at home would correspond to a comparatively large variation in the percentage. Probably, however, the cause of the change is to be sought in the selection of cases, in the earlier years the more severe cases may not have been removed to hospital, whereas at the present time it is the severe ones which are removed.

The proportion of "return cases," *i.e.*, of secondary cases of scarlet fever occurring in a household within 21 days of the return of a convalescent discharged from the hospital, has shown a considerable diminution in recent years, having been on the average 4·4 per 100 discharged cases in the ten years 1892-1901, and only 2·3 in the nine years 1902-1910.

The following table shows the principal complications of scarlet fever met with during the same period expressed as percentages of the total number of cases treated in hospital in each year.

Bagthorpe Hospital, Nottingham.

Principal complications of scarlet fever met with per 100 cases treated:—

—	(*Nose.*) Rhinorrhœa. Rhinitis.	(*Ear.*) Otorrhœa. Otitis.	(*Kidney.*) Nephritis. Hæmaturia. Albuminuria.	(*Glands.*) Glandular abscess. Cervical abscess. Adenitis.	(*Joints.*) Arthritis. Arthralgia. Rheumatism.	(*Lungs.*) Bronchitis. Pneumonia.	Diphtheria.
1892		9·0	3·5	4·0	6·0	—	—
1893		13·8	6·7	3·1	3·0	—	—
1894		13·5[b]	5·9	4·3	1·9	—	—
1895	Not	10·2	3·4	1·4	1·7	·2	—
1896	recorded.	8·2	2·2	2·0	2·3	1·1	—
1897		10·6	3·8	1·7	2·6	1·0	—
1898		6·3	2·2	·6	2·2	1·6	—
1899		5·9	2·6	1·6	1·8	·7	—
1900 ...	7·1	6·8	4·6	1·7+ 7·6*	2·3	2·2	·5
1901 ...	12·0	9·6	17·0	·8+13·0*	1·0	2·0	3·4
1902 ...	25·7	7·4	15·3	1·4+32·2*	2·6	6·6	·6
1903 ...	10·0	5·5	9·0	2·1+24·3*	2·9	5·6	·8
1904 ...	9·4	13·0	9·0	·4+ 3·0*	2·8	·2	·5
1905 ...	14·5	15·0	8·5	1·3+ 6·7*	2·7	·2	·4
1906 ...	17·0	14·9	5·0	1·5	3·8	·6	—
1907 ...	12·2	10·4	3·8	2·1	—	1·0	—
1908 ...	12·9	6·8	2·6	2·3	1·3	—	1·0
1909 ...	11·3	6·3	4·5 [a]+26·1	1·6	3·5	·4	10·1
1910 ...	8·13	8·57	4·6 [a]+34·5	1·10	2·64	·22	7·9

[a] Albuminuria.

[b] +1·0 per cent. post-aural abscess.

* Adenitis.

During the period covered by this table there has been a succession of resident medical officers at the Bagthorpe Hospital, and it is evident that there has been a lack of uniformity not only as to the nomenclature of the several complications, but also as to what constitutes a complication; conditions such as discharges from the nose, inflamed glands and albuminuria, which by one medical officer have been recorded as complications, by another have been regarded merely as pronounced manifestations of the usual symptoms of the disease.

In so far as the figures are comparable it cannot be said that they show any progressive diminution in the frequency of the various complications, nor, on the other hand, can it be said that they show any increase in the frequency of the complications

such as nephritis, rheumatism, and bronchitis, which may be thought of as specially liable to be induced by exposure to cold. It may be admitted that in clinical medicine the careful observation of individual cases is often more convincing than statistics, based as the latter must be upon units not strictly comparable. It cannot be said that the open air treatment of the acute infectious diseases as carried out at the Bagthorpe Hospital has solved all the problems connected with the hospital isolation of such diseases, but it appears, when carefully carried out, to involve no undue risk to the patients nor difficulty with the staff, and to be worthy of further trial in other hands.

14.—Penistone Joint Isolation Hospital.

This hospital was visited by me on June 30th, 1909, in company with Dr. Kaye, county medical officer.

The hospital district was formed under the Isolation Hospitals Act, 1893, by Order of the West Riding County Council in 1897, an appeal against the Order having been disallowed by the Local Government Board. It comprises the Penistone, Clayton West, Denby and Cumberworth, Gunthwaite and Ingbirchworth, Hoylandswaine, and Thurlstone Urban Districts, and the Penistone Rural District, with an aggregate population of 18,341 in 1911.

The hospital is situated at Hoyland's Moor, in the Hoylandswaine Urban District. The site was given to the hospital committee and comprises 4 acres. Water supply is laid on from the Barnsley Corporation mains, and sewage is disposed of on the site by bacteria beds and irrigation.

The hospital buildings were erected by means of a loan of £6,000 sanctioned by the Board in 1902; and the hospital was formally opened on August 26th, 1905. It comprises—

1. A pavilion, used for scarlet fever, on a modification of the Board's plan C, containing two 4-bed wards, with a 2-bed convalescent room—on similar lines to that at Kirkburton—at one end of the block: total 10 beds.

2. A block on the lines of the Board's plan B of 1900, containing two 2-bed wards: total four beds, or 14 in all.

This block has been used for typhoid cases and the pavilion for scarlet fever.

3. An administration block with eight bedrooms and separate rooms for the caretakers.

4. A laundry block, with hand laundry, a steam disinfecting apparatus, mortuary, and ambulance shed.

I was informed that in the erection of this hospital the aim was to carry out the work at a minimum cost, everything that could be properly dispensed with being omitted. It appears, however, to fulfil all necessary requirements, except that the heating of the wards by stoves has been found insufficient, and at the time of my visit a hot-water system with an underground boiler chamber were being constructed. The grounds at the time of my visit had not been laid out, and were in a rough and unsightly condition; it was hoped gradually to get them into order.

15.—Rhondda.

Hospital at Ystrad.

Visited March 19, 1907, with Mr. Kitchin and Dr. Jenkins, medical officer of health.

The Rhondda Urban District comprises a large area of 23,885 acres, with a population (1901) of 113,735, and a rateable value of £462,354. The population is rapidly increasing owing to the development of the coal mines, and was in 1911 152,798.

The site of the hospital lies off the main road between Ystrad and Llwynpia; it is very exposed, and has a rapid fall from north to south.

The site is 5 acres in extent and cost £800.

The sewage from the hospital is taken into the main sewer, and water is supplied from the council's main. The buildings are lighted by gas, which is supplied from the council's works.

The hospital is surrounded partly by a stone wall 6 feet 6 inches high and partly by a hedge.

The hospital has been built by the council in sections, and has been paid for out of current accounts, and, consequently, without the intervention of the Board.

The original hospital, which is merely a single building containing two small wards, a kitchen, parlour, and two bedrooms, was built in 1887.

This building was in use until 1900, when the two new pavilions and an administrative block were completed, and prior to this date there had been erected a laundry and disinfecting station, discharge block, mortuary, and stable.

The hospital as at present constituted comprises:—

(1) *The old hospital* (which is used for small-pox treatment but will be abandoned for this purpose when the new iron small-pox hospital is erected).

(2) *Administrative block*—containing accommodation for about nine nurses and two or three servants. This building is divided into two portions—back portion containing the kitchen, stores, and offices, the front portion being occupied by the matron, medical officer, and the nurses. The staff at the time of our visit consisted of six nurses and six servants.

(4) and (5) *Two ward pavilions*, each containing two main wards, each for seven beds, and two single-bed separation wards, total accommodation 32 beds.

In addition to these there is a large nurses' duty-room, a ward scullery, and a robing-room.

The baths and sanitary conveniences are in separate annexes.

The two pavilions are designed on the lines of the Board's model plan C, but are more elaborate buildings than is usual in the case of hospitals built by means of loans sanctioned by the Board. The floors are of terrazzo, which is cracked in places.

(6) *Laundry and disinfecting block.*—The laundry consists of a wash-house, drying-room, and ironing-room, fitted with hand-power machinery. The disinfecting wing contains two chambers with an Equifex disinfector between them.

(7) *Mortuary,* with viewing room.

(8) *Discharging block,* of cruciform shape, containing four small rooms arranged in radiating fashion, viz., undressing-room, bath-room, dressing-room, waiting-room.

(9) *Stable,* containing two stalls, harness-room and loft.

The cost of the new hospital has been £15,835 16*s.* 11*d.* (*see* detailed statement annexed), or £494 17*s.* 5*d.* per bed.

The heavy cost of this hospital is due to various causes, but perhaps the most important one is the elevated and exposed position of the site and the steep gradient, which has involved a considerable amount of excavating and expensive foundations. The buildings have been well and substantially built. The floors of the wards are of oak or Venetian marble mosaic; the walls are finished with cement plaster and painted with Blundall Spence's paint. The sanitary fittings are of best quality and elaborate design, and have doubtless been a comparatively large item in the cost.

Robing-rooms and ward sculleries, separate annexes for baths, and four rooms for discharging purposes are items which are not usually found in hospitals of other districts, and which have tended to raise the cost.

Only diphtheria and enteric fever are treated at this hospital, but new pavilions (for 16 and 10 beds) are being erected for the treatment of scarlet fever, and an addition to the administration block is to be carried out. There is no observation block, cases under suspicion being placed in the observation wards attached to the main pavilions; these observation wards are practically independent of the main building, and have a separate entrance from outside. We were informed that though these observation wards have been used for cases of mixed or doubtful infection in no instance had there been a case of cross-infection, and that no "return cases" had occurred up to date of visit.

When the new small-pox hospital has been completed it is intended to utilise the old hospital for observation purposes.

The maximum number of cases treated at one time at this hospital has been 65 (enteric).

Annexed is a statement giving the number of cases in the district and the number treated at the hospital, from which it will be seen that, in the case of diphtheria the mortality for five years has been 13·5 per cent. outside the hospital and 5·6 per cent. inside, and in the case of enteric 15 per cent. outside and 10·7 per cent. inside.

Rhondda Urban District.

Cost of Old Hospital.

	£	*s.*	*d.*
Land (8,133 square yards)	50	0	0
Building	675	0	0
Furniture (estimated)	60	0	0
	£785	0	0

Accommodation—4 beds.
Cost per bed—£196 5*s.* 0*d.*

A statement of the cost of erecting the New Fever Hospital, Ystrad, Rhondda.

	£	s.	d.
Land (5 acres)	800	0	0
Laundry, stable, discharging block, and mortuary	1,480	13	0
Administrative block, two pavilions, and about half the boundary wall	9,684	0	0
Remainder of boundary wall	602	0	0
Heat apparatus	454	0	0
Laundry appliances	167	15	0
Laundry floors (Ward & Co.)	23	8	11
Architect's commission at 5 per cent.	590	10	0
Clerk of Work's wages—			
At £130 a year for 18 months	195	0	0
,, £65 ,, ,, 6 ,, ...	32	10	0
Furniture (including linen, drugs, &c.)	1,310	0	0
Disinfector	285	0	0
Boiler	97	0	0
Ambulance	114	0	0
	£15,835	16	11

Accommodation for 32 beds, or 16 in each pavilion.
Cubic capacity—2,000 cubic feet per bed.
Cost per bed—
(*a*) Including everything given above, £494 17*s.* 5*d.*
(*b*) Excluding land, £469 17*s.* 5*d.*

Estimated cost of additions and alterations now being carried out.

		£	s.	d.
New pavilion (16 beds) ...				
New pavilion (10 beds), with attached discharging block				
Alterations of administrative block	Contract let at...	8,687	1	8
Alterations of laundry, stable, new ambulance-shed and coal-house ...				
Extras allowed on contract		200	0	0
Estimated cost of laundry (additional) fittings ...		270	0	0
,, ,, furnishing		500	0	0
,, ,, heating		445	0	0
Ambulance		114	0	0
Architect 5 per cent.		480	0	0
Clerk of Works: moiety of £117 a year for 18 months		87	15	0
		£10,783	16	8

Additional accommodation provided for 26 beds.
Estimated cost per bed—£414 14*s.* 8*d.*

I.—Diphtheria (including Membranous Croup).

Year.	Statistics for the whole district (including hospital). Cases.	Deaths.	Mortality per cent.	Rest of district (excluding hospital). Cases.	Deaths.	Mortality per cent.	The hospital only. Cases.	Deaths.	Mortality per cent.
1902 ...	757	81	10·7	699	79	11·3	58	2	3 4
1903 ...	327	42	12·8	266	39	14·6	61	3	4·9
1904 ...	214	32	14·9	127	26	20·4	87	6	6·9
1905 ...	139	16	11·5	120	15	12·5	19	1	5·3
1906 ...	194	25	12·9	115	20	17·4	79	5	6·3
Totals	1,631	196	12·0	1,327	179	13·5	304	17	5·6

II.—Typhoid Fever (including Continued Fever).

1902 ...	117	22	18·8	70	15	21·4	47	7	15·0
1903 ...	275	44	16·0	114	34	29·8	161	10	6·2
1904 ...	480	42	8·7	336	23	6·8	144	19	13·2
1905 ...	108	16	14·8	42	7	16·6	66	9	13·6
1906 ...	126	20	15·8	38	11	28·9	88	9	10·2
Totals	1,106	144	13·0	600	90	15·0	506	54	10·7

There were, in addition, 9 cases of small-pox with 7 deaths or a fatality of 11·1 per cent., treated at the hospital during the 5 years given.

Rhondda Urban District Council.

Isolation Hospital.

Cost of maintenance.

		£	s.	d.
*1902.	Cost per patient per week	1	10	0½
1903.	,, ,, ,, ...	1	0	7½
1904.	,, ,, ,, ...	1	1	9
†1905.	,, ,, ,, ...	2	17	3
1906.	,, ,, ,, ...	1	4	3½
	Average for 5 years	£1	10	9½

March 19th, 1907.

16.—Settle Rural Isolation Hospital, Austwick.

Population of district in 1911, 14,902. Area 152,007 acres.

The Settle Rural District Council and their predecessors the Rural Sanitary Authority had for many years, under the circumstances mentioned in Sir R. Thorne's "Report on the use and

* Three introductions of small-pox into the district at different times. Expenses so incurred included.

† Two cases of small-pox. Expenses caused are included. The wards closed in succession to allow them to be painted.

influence of Hospitals for Infectious Diseases," p. 238, maintained as an isolation hospital for the general use of the inhabitants of their district the hospital for infectious cases situated in the grounds of the Settle Union Workhouse at Giggleswick. The arrangement was renewed from time to time with the Board's sanction, given, however, latterly with hesitation on account not only of the proximity of the building to the workhouse, but also of its structural deficiencies and its want of proper administration. In May, 1903, the district council's tenancy having expired the Board refused further sanction to its renewal, and under pressure from the West Riding County Council it became necessary to provide another hospital.

On August 13th, 1904, the Board sanctioned a loan of £600 for the purchase of a site, and on March 17th, 1906, one of £6,500 for the erection of a hospital of 20 beds. The hospital was opened on February 13th, 1909, and its cost to that date was £6,528 or £326 per bed, or with site £356.

The hospital, which was visited by me on July 1st, 1909, in company with Dr. Kaye, county medical officer, and Dr. Atkinson, medical officer of health of the Craven combined district, is one of the latest that has been built under the auspices of the West Riding County Council and embodies their most recent experience, and it has been well built and equipped at a comparatively moderate cost.

The site is at Austwick in the rural district, and is somewhat inconveniently remote, being $4\frac{3}{4}$ miles from Settle and $2\frac{1}{2}$ miles from the nearest railway station, but topographically it is fairly central for the most populous parts of this extensive district, and it adjoins the Keighley and Kendal high road along which there are telephone lines to which the hospital is connected. The Austwick sewers and water supply also are available. The site is five acres in extent and is of an L-shape; it is surrounded by a stone wall.

The buildings are of stone, which is abundant in the neighbourhood. They comprise a pavilion on plan C with 8-bed and 6-bed wards, used for scarlet fever; a double block on a modification of plan B, having in each wing a 2-bed and a 1-bed ward; an administration block of three storeys (one being in the roof), containing six bedrooms and two cubicles, and caretaker's quarters; a laundry block with hand laundry, steam disinfecting apparatus and ambulance shed; a discharge block and mortuary; and a stable and cart shed. The walls of the wards are lined internally with cement plaster; the floors are of maple boards. The means of warming are double Shorland's stoves with upright flues; no complaint was made of these smoking, and they had not been found insufficient although the site is an upland one. The fittings generally are good. Furniture cost only £300 or £15 per bed. Lighting is by means of "petrolite" lamps, burning petrol vapour with incandescent mantles.

The discharge block contains two rooms only, the bath being in the undressing room, which also contains the hot water cylinder, the water in which is heated by the fire in the dressing room;

by this arrangement a room and a fire-place and fire are saved, as compared with the more usual one of separate undressing room, bath room, and dressing room.

The low cost of this hospital per bed is largely due to the favourable circumstances of the site, building material being at hand, and a sewer and public water service available. There appears also to have been a strong local feeling in favour of economy.

17.—Sevenoaks Rural District.

Chiddingstone and Otford Hospitals.

The Sevenoaks Rural District affords an instance of a single rural district being divided into two separate areas for the provision of isolation hospitals. It is an extensive area, comprising 63,336 acres, with a population (1911) of 24,030; it surrounds the Sevenoaks Urban District and is divided into two nearly equal portions by a prominent ridge of hills, without collective name, which runs through it in an east and west direction at about its centre.

The parishes to the south of this ridge of hills, viz., Chiddingstone, Cowden, Hever, Edenbridge, Leigh, and Penshurst, with an aggregate population (1891) of 7,813, which in 1911 had increased to 8,239, were in 1899 formed into a hospital district by an Order of the Kent County Council under the Isolation Hospitals Act, 1893, issued after a local inquiry at the instance of the Penshurst Parish Council. Appeals by the parishes of Hever and Edenbridge against the Order were dismissed by the Local Government Board.

In January, 1901, a loan of £5,700 was sanctioned by the Board for the provision of a hospital of 12 beds on a site of six acres in the parish of Hever, which had already been purchased, the cost, £360, being included in the loan. In addition to the amount of the above loan, further works, estimated to cost £1,050 were to be carried out partly by aid of loan from the Kent County Council, making the total estimated cost of the hospital £6,750, or £562 10*s*. per bed, or £532 10*s*. without site.

The hospital was opened in 1902. It comprises two ward-blocks, an administration block with five bedrooms, and a laundry block containing wash-house, drying closet, ironing room, disinfecting chambers with steam apparatus, mortuary, ambulance shed, and heating chamber for hot water supply.

The wardblocks, which are similar to one another, are of a special design, each containing a 3-bed, a 2-bed, and a 1-bed ward; this design was planned by Mr. Maberly Smith, architect, on the suggestion of Dr. Tew, medical officer of health, its object being to facilitate the classification of patients according to sex and to the diseases from which they might be suffering. It is stated that experience has shown that varying and unequal numbers of male and female patients can be better accommodated without waste of space in a block of this arrangement than in one of two wards only. In a block with 3-bed, 2-bed and 1-bed wards, six patients can be accommodated at a time whatever the

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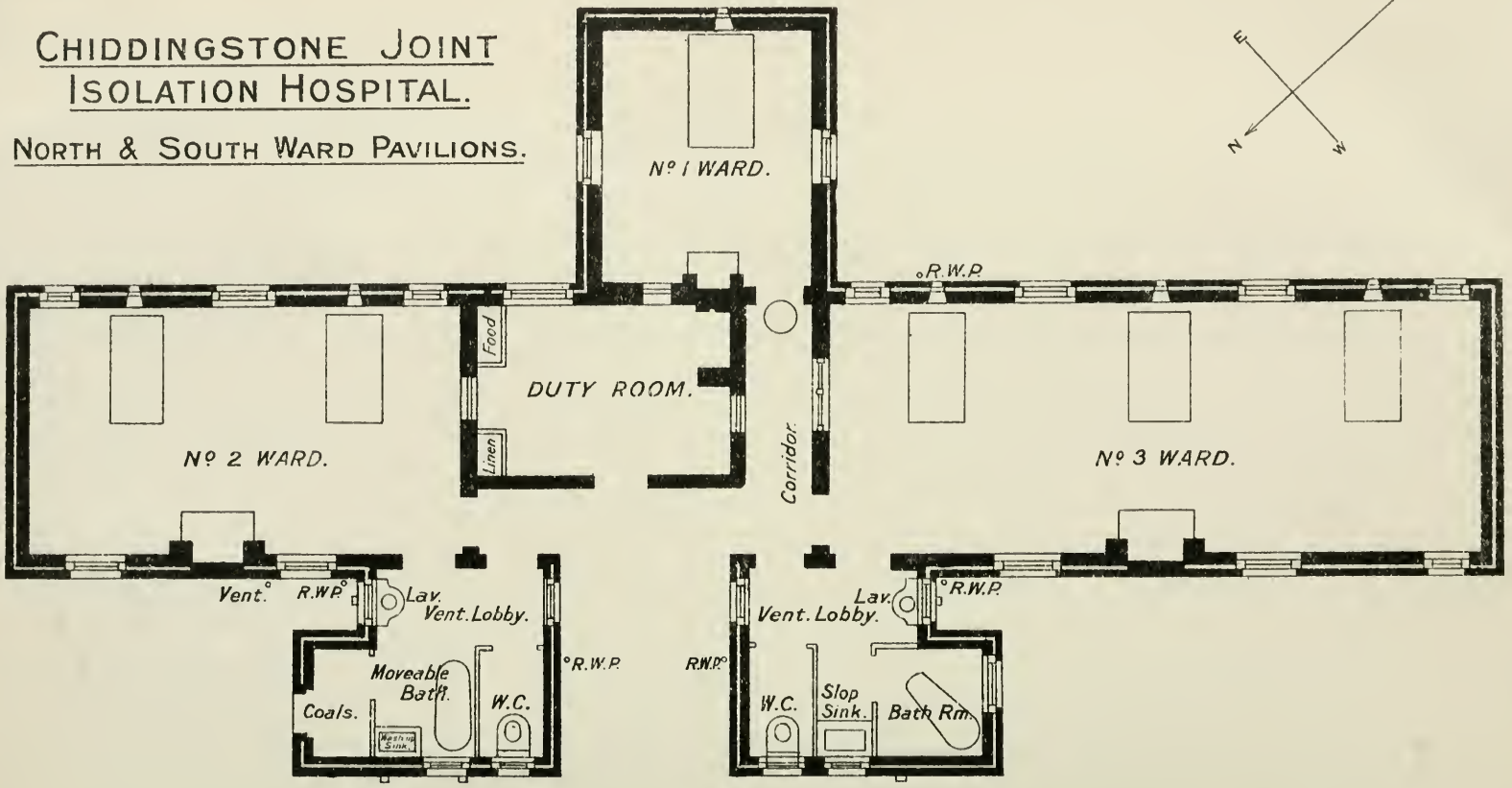
CHIDDINGSTONE JOINT ISOLATION HOSPITAL.

NORTH & SOUTH WARD PAVILIONS.



Malby & Sons, Lith.

proportion of the two sexes, whereas in a block of two 3-bed wards if there were four patients of one sex, there would be no beds which could be used for patients of the other sex (*see* plan opposite).

For the northern parishes of the Sevenoaks Rural District, a separate hospital has been provided by the district council on a site of five acres at Otford. A loan of £2,600 for the purchase and fencing of this site was sanctioned by the Board in 1904, and one of £6,700 for the erection of a hospital of 12 beds in 1906. The hospital was completed and in use by the end of 1907.

The buildings at this hospital are similar in design to those at the Chiddingstone Isolation Hospital, but in addition to the permanent buildings there are on the site several Berthon tents and wooden huts which were in use there as a temporary hospital before the erection of the permanent buildings. One of these at the time of my visit in 1909 was about to be converted into a discharge block. The administration block was made rather larger than that at the Chiddingstone Hospital in order that it might accommodate the staff required for these temporary blocks.

I have seen both of these hospitals, which are well built and appear suitable for their purpose. The walls are of brick with a cavity lined internally with hard impermeable plaster; the floors of wood blocks with concave terrazzo mouldings at their junction with the walls.

The form of wardblock is a somewhat expensive one per bed; at both hospitals the wardblocks were estimated to cost £1,300 each or £216 per bed, but it is claimed that owing to the facility for classification of patients according to sex the same number of beds goes farther in blocks of this kind than in blocks on the Board's plans. I think, however, that there might have been advantage if one of the blocks at each hospital had been a pavilion on the Board's plan C, capable of containing a larger number of patients at probably no great increase of cost of construction. At my visit to the Otford hospital I found five and three beds respectively in the wards designed for three and two beds, and on one occasion it was reported to the Board by one of their inspectors on the occasion of an outbreak of diphtheria at Cowden that cases of that disease were refused admission to the Chiddingstone Hospital on the ground that it was full of scarlet fever patients.

The Otford Hospital has been an even more expensive one than the Chiddingstone Hospital, the cost per bed, for 12 beds, working out to £775, or exclusive of site to £587 10*s*. The chief cause of excess in the case of the Otford Hospital was the costliness of the site. The neighbourhood of Sevenoaks being an attractive and residential one, and much of the property being in the hands of large owners who refused to sell, the district council found great difficulty in obtaining any site at all, and it was not until they had made an application to the Board for a Provisional Order giving them compulsory powers of purchase, and a local inquiry had been held, that they received the offer of a site alternative to that which they had selected, and even then they

had to pay for this site at the rate of £400 an acre, besides legal expenses, whereas the Chiddingstone Hospital Committee had been able to acquire a site at the rate of only £60 per acre.

As regards the capabilities of the two sites there was not much difference; at both, public water services were available, and at Otford drainage could be obtained into a public sewer, while at Chiddingstone sewage had to be treated on the site.

But if a site could have been obtained in a suitable central position there would have been a great saving of cost if a single isolation hospital had been made to serve for the whole area of the Sevenoaks Union (area 66,595 acres, population (1911) 33,213). As it is there are three hospitals in the rural district, for the Sevenoaks Urban District Council has a hospital of its own of similar design, situated in the rural district. One site only, with its attendant expenses of cost of conveyance, fencing, laying on water, sewage disposal, &c., would have been needed instead of three, and the cost of duplication of buildings would have been avoided. The following table shows the estimated cost of buildings:—

	Chiddingstone Hospital.	Otford Hospital.
Wardblocks, each	£1,300	£1,300
Administration block	£1,500	£1,475
Laundry block	£525	£600
Fittings and disinfecting apparatus	?	£525
Ambulance	£120	£120

18.—Stroud Joint Isolation Hospital, Cainscross.

Visited on March 20th, 1907, with Mr. Kitchin and Dr. J. Middleton Martin, medical officer of health.

The Stroud Joint Hospital District, which was formed by Provisional Order of the Local Government Board in 1894, comprises the three sanitary districts in the Stroud Union, viz:—

	Area, acres.	Population, 1911.
Stroud Urban	1,168	8,772
Nailsworth Urban ...	1,596	3,031
Stroud Rural	37,223	28,069
Total	39,987	39,872

Patients are also occasionally received by agreement with the district council from the adjoining Wheatenhurst Rural District at a charge of £3 3*s*. a week.

The hospital, which was erected by means of loans sanctioned in 1901 and 1902 and was opened in December, 1904, contains 44 beds, and is situated at Cainscross, about a mile from Stroud, a position conveniently central for the populous parts of the joint district.

The site is well situated on rising ground commanding a fine view of the Cotswold Hills. The total area of land is 4 acres, of which 3½ form the hospital enclosure: this is surrounded by a corrugated iron fence, 6 feet 6 inches high, with angle-iron standards. The hospital is drained into the Stroud Rural

District Council's sewers and supplied with water from the Water Company's service; gas is also laid on for lighting, and there is telephonic communication.

The hospital buildings comprise entrance lodge with waiting room, living room, scullery, &c., and two bedrooms; administration block with matron's room and office, nurses' sitting-room and dining-room, medical officer's room and dispensary, and 12 bedrooms (one other bedroom originally provided has been used as a cistern room); three pavilions on the lines of the Board's plan C, one with two 8-bed wards and two having each two 6-bed wards; and an isolation block on the lines of the Board's plan B (1900), comprising two 2-bed wards and nurse's room, with a verandah in front.

The administration block and wardblocks are all heated by a low-pressure hot water system from a central boiler placed in the basement of the administration block. This situation is not a good one in so far that the basement is approached by stairs from the interior of the block into which in certain states of the wind sulphurous fumes from the furnace are apt to be blown. From this boiler pipes are carried in subways to each block, and there are radiators in the wards and one in each w.c. annexe. Hot water for baths is obtained from boilers heated by the fireplaces in the nurses' duty rooms: the supply is said to be sufficient.

The laundry block contains wash-house with hand machinery; ironing-room with drying closet; disinfecting house with Goddard, Massey, and Warner's steam disinfector (£205 10*s*.) ambulance shed, mortuary, and coal-house.

The buildings generally are of a substantial but plain character, there being no attempt at decoration. The wards indeed have a somewhat unnecessarily cheerless aspect, especially owing to the lower panes in the windows being of obscure glass. We could not learn what was the object of this: it seems a pity to debar the patients from seeing the fine views which the hospital commands; and the arrangement also prevents the practice which obtains in many hospitals of allowing visitors to see the patients through the windows without entering the wards. The floors are of deal boards in narrow widths laid on solid concrete. The walls are finished internally with plaster and distempered. No special closets are provided for the nurses in the wardblocks; when on duty the nurses use the closets in the administration block. In the scarlet fever pavilion one bath is provided for 16 patients, and this has proved sufficient. All linen is kept in the administrative block.

Generally speaking the hospital appeared sufficiently equipped, though the furniture was of a somewhat plain character. The only deficiency appeared to be that of a discharge block, the want of which was stated to be much felt.

The hospital has never as yet been full, the largest number of patients under treatment at any one time having been 21; but at that time all the four wardblocks were in use owing to there being patients having different diseases.

The diseases usually admitted are scarlet fever, diphtheria, and enteric fever; but one case of puerperal fever was received on an emergency. There is a separate hospital of a temporary character at Bisley for small-pox.

During this period 1904-1907 no "return" cases have occurred, and in no case has a patient admitted with one disease contracted another in hospital.

Dr. J. Middleton Martin, medical officer of health for the Stroud Urban and Rural, Nailsworth Urban and Wheatenhurst Rural Districts, and to the Gloucestershire County Council, acts as medical superintendent of the hospital and medical attendant on the patients. There is a resident porter, who acts as gardener, and a matron and staff of nurses. The ambulance is horsed by contract: 6*s*. being charged for a journey to any part of the joint district. The steam disinfector is used for the disinfection of infected articles brought to the hospital.

With a view to reducing the cost of upkeep of staff at times when there are few or no patients in the hospital, Dr. Martin has drawn up a scheme (appended) which has been approved by the Gloucestershire and Worcestershire County Councils and the Town Councils of Bristol, Gloucester, and Worcester, for the interchange of nurses between one hospital and another as the needs of each may require. The nurses whose services were not required at the time by the hospital authority engaging them, might, while still remaining the servants of that authority and receiving from them their usual pay, be lent to other hospitals for a payment of £1 1*s*. per week, or £1 10*s*. in the case of small-pox, of which the nurse would receive one-third. This arrangement it was hoped would be of advantage all round. The hospitals would be able to maintain a smaller permanent staff than would otherwise be necessary, since they would be able to engage the services of additional nurses on occasions of pressure at a cheaper rate than by hiring from a nursing institution, and they would also be relieved of the cost of the keep of unemployed nurses. The nurses on the other hand would receive additional payment for the times when their services were lent to other authorities. But during the time that this arrangement has been in force, the circumstances at the Stroud Hospital have not been such that it could be given effect to.

The cost of this hospital, £285 per bed, or, exclusive of site, £270 per bed, must be regarded as very moderate for a brick-built hospital complying with the usual requirements. Its comparatively low cost is to be ascribed to the following circumstances:—

1. The cost of the site was not excessive, and as sewers, a public water service, and gas were available, and the site adjoined a high road, expense on works of sewage disposal, water supply and lighting, and also on road-making, was avoided.

2. The district appears to be one in which the price of building is low.

3. The hospital, though substantially built and provided with essential requirements, is of plain and simple design and ordinary materials; ornament and superfluities being dispensed with. The

wardblocks closely follow the Board's model plans, being unprovided with accessories, such as single-bed wards, which, however useful, add materially to the cost. The furniture is also very plain, costing only £22 2*s.* per bed.

The only directions in which it appeared to us that a saving could have been effected were—

1. Number of beds. So far as the present experience has gone, a less number of beds than that provided, viz., 44, might have sufficed in the first instance, although all the wardblocks have been in use. But the omission of a wardblock or a reduction in size of one or more wardblocks, although it would have reduced the total cost of the hospital would have increased the cost per bed, since the cost of the administration block and out offices could not be reduced in like proportion, and would have had to be divided among a less number of beds.

2. Central heating system. This cost (including subways), £732, and it is perhaps questionable whether the advantage is commensurate with the cost in an establishment in which some of the blocks may be unoccupied for long periods. But with a heating system fewer and cheaper stoves suffice in the wards, and it is claimed that the system saves fuel, labour, and dust: it has also advantage, even when the wardblocks are empty, in enabling them to be kept aired, and in preventing damage to water pipes by freezing in severe weather.

The appended statement of cost of this hospital was given us by Dr. Middleton Martin:—

Stroud Joint Isolation Hospital.

Cost of construction and fitting from information given by Clerk and Architect, 20th January and 6th October, 1905.

	£	*s.*	*d.*	£	*s.*	*d.*
Land				650	0	0
Buildings	9,140	0	0			
Roads	240	0	0			
Boundary fence, gates, &c. ...	166	13	6			
Outside gas	41	11	4			
				9,588	4	10
Heating	508	5	6			
Channels for heating ...	224	1	2			
				732	6	8
Furniture	880	0	0			
Dressers, meat safes, &c. ...	33	11	6			
Ironmongery	60	0	0			
				973	11	6
Laundry	200	0	0			
Disinfector	205	10	0			
Ambulance	100	0	0			
				505	10	0
Sundries				372	12	6
Architect				105	0	0
				£12,927	5	6

	£	s.	d.	£	s.	d.
Credit:						
Stoves	248	0	0			
Movable fittings	73	10	0			
Gas fittings	42	0	0			
Floors	25	0	0			
				388	10	0
				£12,538	15	6

Total number of beds—44.
Average cost per bed—£285.
Do. exclusive of site—£270.

The loans sanctioned by the Board were £750 for site and £12,500 for buildings, or total £13,250. The hospital appears, therefore, to have been constructed for less than the estimated cost.

NURSES EXCHANGE FOR ISOLATION HOSPITALS IN THE ADMINISTRATIVE COUNTIES OF GLOUCESTERSHIRE AND WORCESTERSHIRE AND THE CITIES OF BRISTOL, GLOUCESTER AND WORCESTER.

SCHEME prepared by the county medical officers for Gloucestershire and Worcestershire, as amended and approved by committee appointed at conference held at Gloucester on 12th May, 1906, to frame in detail a scheme for loan of nurses between isolation hospitals, and as approved at a conference of Gloucestershire and Worcestershire hospital authorities held on the 13th October, 1906.

Adopted by the Gloucestershire County Council on the 22nd day of October, 1906, and the Worcestershire County Council on the 10th day of December, 1906.

1. Registers of nurses available for work to be kept—one for the county of Gloucester and the cities associated with it, and one for the county of Worcester and the city of Worcester.

2. The county councils of such administrative counties to be asked to keep such registers, and to act as centres of communication.

3. Any isolation hospital authority participating in the scheme who
(1) Have nurses available—(the " Lending Hospital ");
(2) Require nurses —(the " Borrowing Hospital "),
to communicate with the centre for their area, giving such particulars as may be arranged.

4. Each centre to satisfy the needs of its area as far as it is able. If at any time either centre should not have a nurse available, it shall put the borrowing hospital in communication with the other centre.

5. When requested, the registration centre to put the borrowing hospital authority into communication with a lending hospital authority, but the arrangement for the actual transfer of the nurses, and the payment of the fees according to the scale to be made directly by the hospital committees concerned.

6. The fees payable in respect of such services by the borrowing to the lending hospital shall be:—
(1) For nursing small-pox—
1½ guineas per week (trained nurse).
1 guinea per week (probationer of not less than one year's service).
(2) Other diseases than small-pox—
1 guinea per week (trained nurse).
15s. per week (probationer of not less than one year's service).
Travelling expenses (including third-class railway fare) each way will be paid by the borrowing hospital.

7. The term " nurse " where hereafter used in this scheme shall include a probationer.

8. One-third of the fee received by the lending authority, together with travelling expenses, shall be paid to the nurse in addition to her salary, to compensate her for moving.

9. A borrowed nurse may be recalled or returned on 24 hours' notice being given. Any hospital giving up a nurse to have the first claim on any other available nurse at either of the centres.

10. A borrowed nurse, for the time of borrowing, to be subject to the rules of the borrowing hospital, and to undertake either day or night work, as may be required, and in cases of emergency, if she expresses her willingness to do so, she may undertake both day and night work.

11. If a borrowed nurse considers she has reason to complain of the treatment she receives, or of the rules under which she is compelled to act, at the hospital of the borrowing authority, she shall be at liberty to submit a written complaint to the borrowing authority, through the officer in charge of the hospital of such authority, and in such case shall send a copy of such complaint to the lending authority, and, in the event of the borrowing authority failing to deal promptly with such complaint to the satisfaction of the lending authority, such authority shall be entitled to withdraw their nurse on giving 24 hours' notice to the borrowing authority.

12. The committee of the borrowing hospital shall arrange for the disinfection of the borrowed nurse's clothing, and the matron of the borrowing hospital shall inform the matron of the lending hospital as to the particular disease the borrowed nurse has been last attending, in order that the medical officer of the lending hospital may be satisfied that the nurse in question cannot convey infection from the borrowing to the lending hospital.

13. Any hospital authority, whose hospital is placed outside the counties of Gloucester and Worcester, but who provides accommodation for districts inside either of those counties, may participate in this scheme on the conditions named above, and communications shall be addressed to the centre in which the district served by such hospital is situated.

19.—Tonbridge Rural District.

Capel Hospital.

This hospital was originally erected in 1887 by means of loan. The site cost £300 and the buildings £2,700. I visited the hospital on March 30th, 1909, in company with Mr. Kitchin, the Board's architect, and with Dr. Tew, medical officer of health, and Mr. Harris, surveyor. The object of our visit was especially to see a new wardblock of corrugated iron, lined with an incombustible composition, which had recently been erected by the district council out of current rates.

The site of the hospital is at Capel in the parish of Pembury, and it is three acres in extent. Water is supplied from the public mains; sewage is disposed of on the site.

The new block is of timber framing covered with corrugated iron, and consists of two wings, each comprising a larger and a smaller ward, with a nurse's duty room between them. It differs from the ordinary construction of such buildings only in the following respects, viz.: 1st that the two wings of the block are separated by a nine inch brick party wall, and 2nd that the wards are lined internally with an asbestos composition called "eternite," in sheets, instead of with match boarding. The larger ward in each wing measures 30 feet by 16 feet, and is 10 feet high to the eaves and 16 feet to the ridge of the open roof, = 6,240 cubic feet capacity, or 1,560 cubic feet per bed, there being four beds. There are two 3-light windows at each end, but at the time of our visit only the upper part of each window, which is a hopper-light, could be opened. There are also two small windows which open, one in the gable at each end, and a ventilator in the roof, but there are no windows between the beds at the sides. The floor is of boards and not

good: there is, we were informed, a concrete layer under it. The framework of the walls rests on dwarf brick walls, above which is a damp proof course. The outer surface of the walls is formed of corrugated iron under which there is a layer of felt. The eternite is in slabs eight feet high by four feet wide, and is a little over one-eighth of an inch thick. The slabs are fastened on by narrow wooden fillets, and both slabs and fillets are painted with "duresco," which gives an impervious but somewhat rough, and not very easily cleaned, surface. There is a skirting board at the bottom, but the angles with the floor are not rounded. The shape of the fillets and mouldings might be improved with a view to avoiding angles in which dust and dirt may lodge.

We were told that it had been found impossible to keep the larger wards at a proper temperature during cold weather with the stoves originally provided; and in one of these wards a very powerful anthracite stove, said to be intended for warming a room of 18,000 cubic feet, has been recently substituted. The displaced stove has been removed to the other large ward where it has been fixed side by side with the stove originally provided there. With the new large stove it was found possible to keep the temperature of the ward up to 60° F. in the recent cold weather, but the consumption of fuel was large.

The smaller wards measure 20 × 16 feet, and are of the same height as the other, giving 4,160 cubic feet capacity: each contains two beds and two cots. They have open fireplaces in the brick party wall, and no difficulty has been found in warming them, otherwise the wards are of similar construction to the larger ones.

The wards in each wing open to a verandah, both verandahs face the same way, but are separated by a partition with a door in it. The two pairs of wards are sometimes used for different diseases as for diphtheria and enteric fever.

A movable bath on wheels is used. Earth closets in annexes off the verandah were originally provided, but have been replaced by w.c.'s. There is no hot water apparatus; hot water for baths being obtained from a copper in a neighbouring out-building.

The block, containing about 16 beds, cost £455 as placed on foundations, including eternite lining £45, and stoves £128, in addition the foundations cost about £100, and the drainage £20. But there has been subsequent expenditure, as already mentioned, in providing a new stove, w.c.'s, and hot water supply, and even now the block cannot be considered very well equipped. The amount of space per bed is also below the Board's standard; allowing 2,000 cubic feet of space per bed it would only hold ten beds.

The cost of the "eternite" lining is stated to be 24*s.* per 100 square feet, as against 19*s.* for match boarding. Its use in place of the latter partly removes two of the main objections to hospital buildings of frame construction, viz., their ready inflammability and the existence of numerous crevices in which dust, infection, and vermin may lodge. But the objection on the ground of the imperfect protection which they afford against extremes of weather remains, though it might perhaps be lessened by filling the hollow walls with some non-conducting material as

sawdust, and by ceiling the roof. It will be seen also that the ready-made hospitals sold by makers of iron buildings are lacking in important requisites, and that their apparent cheapness as compared with brick buildings is to that extent illusory.

20.—Tunbridge Wells, Tonbridge and South Borough Joint Small-Pox Hospital Board.

Dislingbury Small-Pox Hospital.

This Joint Hospital District was formed by Order of the Local Government Board in 1902, to comprise all the districts in the Tonbridge Union, viz.: the Tunbridge Wells Municipal Borough, Tonbridge and Southborough Urban, and the Tonbridge Rural Districts. Each of these districts has an isolation hospital of its own for infectious diseases other than small-pox, but the need for a hospital for small-pox was felt owing to the liability to the introduction of that disease by hop-pickers, the district being a hop growing one. The area of the combined district is about 53,902 acres, and the population (1911) about 75,271. The hospital which has been provided by the Joint Board was visited by Mr. Kitchin and myself on March 30th, 1909, in company with Dr. Tew, medical officer of health, and Mr. Harris, surveyor. It has been paid for out of current rates, without the aid of loan.

The site is at Dislingbury in the Tonbridge Rural District in a very sparsely populated locality. It comprises about ten acres of land with an old wooden farmhouse which serves as an administration block. The lot was bought at an auction for £700. $2\frac{1}{2}$ acres have been enclosed to form the hospital curtilage, and are fenced with a double fence of barbed wire, the intervening space of 25 feet being planted with shrubs. The main of the South Kent Water Company has been extended to furnish a water supply to the hospital. Sewage is disposed of on a portion of the land about 250 yards distant from the hospital.

The wardblocks and offices are of corrugated iron; the wards are of the usual type of ready-made buildings, and are lined with match boarding. There is a larger wardblock on the lines of plan C, containing two 6-bed wards, and a smaller one similar in arrangement to that at the Capel Hospital, containing in each wing a 2-bed and a 3-bed ward, the total number of beds being 22.

There are also a wash-house, a discharging block, a disinfecting block—containing Thresh's apparatus—and a mortuary.

The cost of these buildings is given me as follows:—

Building.	Cost of superstructure.	Cost of foundations.	Cost of furniture, &c.
	£	£	£
			Furniture.
12-bed ward block	350	60	70 }
10-bed ward block	460	80	50 } 145
Wash-house	90	20	25 }
			Appliances.
Discharge block	30	—	—
Disinfector block	60	35	—
Disinfector including chimney shaft	—	—	150 }
Mortuary	25	5	— } 265
Ambulance	—	—	115 }
Total	1,015	200	410

Thus while the cost of the iron wardblocks as supplied by the makers was £810, the total cost of the hospital was £2,325. The number of beds being 22, the cost per bed was about £105; this is cheap, but the Hospital Board were fortunate in obtaining a site and existing house upon which little had to be spent. The premises were in fair condition when seen by us in 1909, after about five years' use, which, however, is occasional only.

A married couple are in charge, who receive 25*s*. a week and board themselves when the hospital is empty. They receive board when patients are in, and when the number of patients exceeds three they receive £2 a week pay. Nurses are engaged for the patients when required.

21.—Undercliff Joint Hospital District.

Ventnor Isolation Hospital.

The Undercliff Hospital District, which has an area of 6,542 acres, and a population (1911) of 9,058, was formed by Order of the Isle of Wight County Council dated March 13th, 1896, and consists of the Ventnor Urban District and the parishes of Bonchurch, Wroxall, Whitwell, St. Lawrence, Niton, and a part of Godshill (since included in Ventnor Urban District) in the Isle of Wight Rural District. An appeal by the rural district council against the Order was dismissed by the Local Government Board on January 18th, 1897, there appearing at that time to be no prospect of a hospital being established to serve the whole rural district.

A loan of £2,320 for the erection of a hospital was sanctioned on May 12th, 1902, and further loans of £700 and £400 at later dates for its completion—a total cost of £3,420. As the hospital was designed for four beds in accordance with the Board's standard of cubic space, the cost per bed was £855—a high figure.

The hospital was visited by me on April 29th, 1910, in company with Dr. Roberts of Ventnor, consulting medical officer to the Isle of Wight County Council.

The hospital is in the Ventnor Urban District and stands on a site of $1\frac{3}{4}$ acres in an elevated windy position. The town sewers and water supply are available; but as the pressure in the latter is insufficient to raise the water to the hospital buildings it is delivered into a cistern in the lower part of the grounds and raised by a wind pump into a tank at a level high enough to supply the hospital; this arrangement is said to work satisfactorily.

The hospital contains one wardblock containing two wards and duty room. The wards are planned for two beds each, but I found five beds in each. They are connected at the back with a verandah having a glazed roof and closed at the ends. The two wards are thus in enclosed aërial communication with one another, but they have been used, I was told, on occasion for cases of different diseases, treated simultaneously, but attended by different nurses; and no cross infection has occurred. The doors at the ends of the verandah at such times are left open. On the opposite side of the verandah are a bath-room with movable bath, w.c.'s, &c. The supply of hot water is from a boiler at the back of the fireplace in the duty room, and is said to be satisfactory. There is a laundry block containing a Thresh's disinfecting apparatus

and an ambulance. The administration block contains four bedrooms. It is occupied by a caretaker and his wife and their two children, who reside on the premises. The wife acts as nurse, but extra nurses are hired when necessary. On one occasion when the hospital was full, cases were treated in the administration block, the caretaker's children being sent away for the time. There is no medical superintendent, each medical practitioner continuing to attend his own patients after removal to the hospital. The hospital is often empty for long periods, and at the time of my visit the only patient in it was a case of diphtheria sent from Newport some ten miles distant.

This hospital affords an illustration of the disadvantages of providing hospitals for too small areas. The population of the hospital district in 1901 was 9,058. The number of cases of infectious disease is not sufficient to keep the hospital in frequent use, or to warrant the maintenance of an efficient staff. The arrangements for administration and for separation of different diseases cannot be regarded as satisfactory. The hospital has been an expensive one in proportion to the accommodation for patients, as the same administration block, laundry, disinfection, ambulance, and other appliances might have served for a larger hospital. The reason for establishing a separate hospital for the Undercliff District was, I believe, that it was considered that the distance to a hospital central for the whole island would be too great for the removal of cases, but in practice it appears that the distance does not prevent the removal of patients to the Ventnor Hospital from places so distant as Newport.

22.—Waltham Joint Hospital.

The Waltham Joint Hospital Board was formed in 1902 for the urban districts of Waltham Holy Cross, Chingford and Buckhurst Hill, to which in 1908 Woodford was added. The area of the joint district is 16,859 acres, and the population in 1911 is 38,366.

In 1903-6 the Local Government Board sanctioned loans of £1,400 for the purchase of a site and of £9,350 for the erection of a hospital containing 24 beds, in a 12-bed, an 8-bed, and a 4-bed block; also administration block, laundry and mortuary block, and porter's lodge. The cost of the hospital per bed up to this point was £450, including site, or £390 without site. In 1907, to provide for Woodford joining the district, another block was added, containing 16 beds, at a cost of £4,100. This addition—while it raised the total cost of the hospital to £14,850, reduced the cost per bed to £371, or without site, £336.* The demand for accommodation has not, however, as yet been greater at any time than the original hospital could have supplied, and the new pavilion has only been used at times when the old ones were undergoing cleaning.

I visited the hospital on September 22nd, 1911, with Mr. J. Damer Priest, medical officer.

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* £591 8*s.* 7*d.* out of the amount of the loans appears to have been repaid as not required, reducing the total cost per bed to £356.

The site is at Honey Lane, about a mile from the town of Waltham, in a pleasant open situation near the border of Epping Forest; it is, however, rather cold, having a clay soil and a slope to the north. The site is 10 acres in extent, but of this the hospital enclosure forms only about two acres at the highest part, next the lane, the remainder being let to a farmer. The hospital sewage is disposed of on this latter portion, by means of a septic tank and filter, with revolving sprinkler, the effluent being distributed over the land at the lower portion of the ground. Water from the East London service of the Metropolitan Water Board is laid on. The hospital grounds are enclosed by a close oak fence.

The wardblocks follow generally the Board's plans, the 8-bed, 12-bed, and 16-bed pavilions being on the lines of plan C, each of the two latter having a day-room above the centre portion, while the 4-bed block follows plan B. In practice the 12-bed block is used for scarlet fever, the 8-bed block for diphtheria, and the 4-bed block for enteric fever, these being the only diseases received; the 16-bed block being kept as a stand-by. There are no single-bed wards for the isolation of doubtful or mixed cases, and as the beds are allotted, the wards in the small block are not available for the purpose. The medical officer says that small isolation wards are needed, but that the Joint Board retain the management of the hospital and use of beds in their own hands, his function being limited to attendance on the patients. In each of the wards a cot has been placed between every two beds; so that the hospital is furnished to receive nearly double the number of patients for which it was designed, but so far actual overcrowding with patients seems not to have occurred. The upstair rooms are reckoned as bed accommodation by the Essex County Council for the purpose of contributions under § 1, Isolation Hospitals Act, 1901, but have so far only been used as day rooms for convalescents, or as sewing-rooms, for which purposes they have been found useful.

The buildings are of brick; the ward-walls being distempered internally. In the older blocks the floors of the wards are of red-deal boards of narrow width, tongued and grooved; they are in fair condition, but there is some gaping at the joints. In the new block the floors are of "dolomenT," a red composition apparently containing sawdust; this is beginning to wear rough in places. In the woodwork sufficient care has not been taken to avoid ledges and angles in which dust may lodge.

The wards in the larger pavilions are warmed by central double stoves having rather large upright brick shafts. The warming has been found sufficient.

In the new pavilion, owing to the slope of the ground, there is a space under one end which is used as coal cellars, in one of which a boiler is placed for the supply of hot water. In the other blocks water is heated in boilers behind the fires in the duty-rooms; the hot water cylinder being placed in the linen cupboard with a view to keeping the linen warm and dry.

The administration block contains 12 bedrooms, with sitting-rooms and doctor's room, with small dispensary and laboratory.

The laundry block is fitted with hand machines and a Thresh's current steam disinfector, which is said to be easy of manipulation and to answer well. Generally the hospital appears to be well equipped, except in the matter of single-bed wards, and the furniture, though plain, is sufficient.

There are in the grounds two movable wooden shelters, open in front, each for a single patient. The medical officer finds these very useful in the treatment of acute or septic cases of scarlet fever and diphtheria, but does not use open-air treatment when the weather is wet or cold.

The hospital has been freely used, and a large proportion of the cases of scarlet fever, diphtheria, and enteric fever which have occurred have been removed thither, but there has been no great prevalence of either of these diseases in recent years. The rules in force in the Government factories, in which many of the inhabitants are employed, render them anxious for the removal of patients with infectious diseases to hospital. No charge is made ordinarily to ratepayers, but a few private patients and cases from outside the district have been received on payment. In 1909 there were received 48 cases of scarlet fever, 31 of diphtheria, and two of enteric fever; in 1910, 44 cases of scarlet fever, nine of diphtheria, and two of enteric fever. There have been no cases of cross-infection, except that in three instances children sent in under a mistaken diagnosis of scarlet fever contracted that disease within eight days of coming into hospital. There have been three supposed return cases since the hospital was opened, or about 1 per cent. of the returned convalescents; but in at least two of them the secondary case did not begin until three weeks after the return of the convalescent, and was believed to be attributable to the bringing out of a garment which had been put away undisinfected.

This hospital, which was designed by a local firm of architects and erected under contract by local builders, is a cheap one, reckoned as cost per bed, compared with many hospitals in the neighbourhood of London. The reasons for its low cost, so far as I can gather, are that it is of simple design, following generally the Board's plans, without many special features such as would add to the cost or elaborate equipment. Building seems also to be comparatively cheap in the district: bricks are made locally; timber can be brought cheaply by water; and the local scale of wages at the time when the hospital was built was lower than that in London.

23.—Walthamstow Isolation Hospital, Chingford.

This hospital was visited by me on March 16th, 1906, in company with Mr. Kitchin, the Board's architect, Mr. J. J. Clarke, medical officer of health, and Mr. Holmes, engineer to the Walthamstow Urban District Council. The especial object of the visit was to see the wardblock—which had been recently erected by means of loan—designed on the principle of enclosing each patient in a separate cubicle or compartment with glass walls.

The wardblock in question resembles in general form and dimensions that figured in plan C of the Board's hospital memorandum; but the wards are divided internally by longitudinal and transverse glazed partitions into six compartments, aerially distinct from one another and entered by separate doors from the open air under a verandah. Each compartment measures 12 feet by 12 feet, and contains 2,000 cubic feet. The partitions consist of a dwarf wall about 3 feet high, and, above this, of sheets of plate glass ¼-inch thick extending to the ceiling. Each compartment is heated by a radiator, and, besides a window of the usual hospital pattern, has four ventilating openings as follows, the first two being intended as inlets and the other two as outlets:—

1st. A perforated box on the floor to which air from the outside is brought from an opening near the ground level beyond the verandah on the opposite side of the block through a duct of stoneware pipes passing under the floor of the adjoining compartment, thus giving through ventilation.

2nd. An inlet near the ground level in the wall behind the bed.

(These two openings are made with movable lids and gratings, and the ducts slope to the outside, so that they can be washed out with a spray.)

3rd. A Sheringham valve above the bed.

4th. An opening in the ceiling.

Under the conditions existing at the time of our visit the warming and ventilation were satisfactory; but it appeared to us that instead of the radiator being in the middle of the cubicle, where it is somewhat in the way, it would have been better to place it over the opening No. 1, so as to warm the incoming air. Owing to the slope of the ground some of the outside inlet openings have had to be placed in pits below the ground level, which must tend to make the incoming air rather damp.

The verandah, which has a glass roof, surrounds the block on all sides, and gives access to the w.c.'s, which are at the ends. The duty-room has a door opening to the verandah at each side, and two inspection windows, which command a view of the whole of the compartments in each half of the block. Over each bed hangs an electric lamp which can be turned on by a switch in the duty-room (as well as by one in the verandah), so that the nurse, without leaving the duty-room can get a view through the glass partitions of any patient in the block by lighting up his cubicle without lighting that of any other patient. In the verandahs, by the door of each cubicle, are pegs for hanging overalls for the nurse and doctor, and there are also lavatory basins with push-taps delivering hot and cold water for their use.

The floor of the compartments is of terrazzo, and the furniture, which is well designed, is of enamelled metal, which is said to be much cheaper than wood. The appearance of the interior of the block is bright and neat.

The wardblock was opened in February, 1906, so that at our visit it had been in use about a month. It had, so far, been used only for cases of scarlet fever, simple or complicated, in the

acute stage, the patients being confined to bed. As soon as they reach the convalescent stage and are able to get up they are removed to a convalescent block, also of somewhat special design. This limitation of the compartment block to patients who are confined to bed has avoided occasion for certain inconveniences, *e.g.*, in the use of the w.c.'s, which it had been feared might arise if the patients were kept in the cubicles during the whole of their stay in hospital. On the outside of the door of each occupied compartment hangs a disc, white or red; white if the patient within has definite and uncomplicated scarlet fever; red if the case is one of doubtful nature or mixed infection. By each door bearing a red disc there hangs a separate overall, which the nurse puts on before entering and removes on coming out; washing her hands with disinfectant soap before going on to another case. If the disease, however, is uncomplicated scarlet fever, it is not deemed necessary to put on a separate overall before visiting each patient.

So far the hospital staff were well satisfied with the new block. The patients appeared to be contented, and, according to the matron, the nurses did not mind having to go out into the verandah to get to them, although there had been some very cold, rough weather since the block was opened: indeed, the matron thought that the nurses looked better for getting more fresh air. Another advantage is that when the patient has been removed the compartment can be thoroughly disinfected with formic aldehyde before another is admitted. It was, of course, too soon to say anything about the success of the principle as regards the progress of the patients or the avoidance of intercurrent infections or "return cases." The number of nurses required for the block of 12 beds is ordinarily three, viz., two by day and one by night; but more might be required if several severe cases were under treatment. The block had only on one occasion been full. At the time of our visit there were several patients in it; in one case scarlet fever being complicated with chicken-pox.

The cost of the block was £2,600, or £216 per bed. The glass partitions cost £260, or nearly £22 per bed. It is claimed for the plan that the cost per bed is considerably less than in a block on the Board's plan B, while there is the advantage that each patient has a room to himself, so that no beds are rendered unavailable through another bed in the ward being occupied by a case of a different kind.

The following modifications might be made in other instances, partly with a view to reducing the cost:—

1. The position of the radiator might be altered as before mentioned, with a view to warming the incoming air. But as a means of securing through ventilation for the compartments the method of underground ducts (which, we understand, has been patented by the surveyor) did not appear to us altogether satisfactory, and a better method might be devised by leading a duct from the upper part of each compartment to open on the opposite slope of the roof as at the Croydon Borough Hospital, p. 31.

2. The height of the compartments need not perhaps be so great as 13 feet.

3. The verandah might be partly enclosed by a dwarf screen, so as to give more protection to the nurses in stormy weather.

4. A single lavatory basin in the verandah for the compartments on one side of each wing might suffice.

5. If the use of the block is to be limited to patients who are confined to bed, a reduction in the number of w.c.'s might be made: one for the use of the nurse might suffice.

The convalescent block, previously mentioned, contains 24 beds, and is on the general lines of the Board's plan C, but in the wards the allowance of cubic space per bed is only 1,500 cubic feet instead of 2,000 cubic feet: the beds being placed nearer together than in the Board's plan. In the centre of the block the place of the nurse's duty-room is occupied by a dining-room for the patients, and over it is a large day room, to which a second means of access by an outside staircase has recently been added. The block is considered to answer its purpose well; and its cost was only £2,263, or £94 per bed.

These two new blocks have terrazzo floors, which are preferred by the matron to the polished teak floors in the older blocks as being more easily cleaned. No objection was raised to terrazzo on the ground of its being cold and hard.

This hospital has a bad name for its excessive cost; but as far as the buildings are concerned, though they are well built, we did not observe any unnecessary ornament, or other superfluity, except perhaps a somewhat free use of polished teak wood, which, besides being costly, has a somewhat unpleasant smell.

The causes of the high cost of the hospital, both in construction and maintenance, are stated to be—

1st. The site is outside the district, in that of Chingford. Its distance increased the cost of building and a long length of sewer had to be constructed. Heavy rates have to be paid to Chingford, and the distance from Walthamstow involves extra cost in administration and conveyance of patients. Although the cost of the site per acre was only £133, a large plot—20 acres—had to be purchased. The medical officer of health, who was not then in office, says that an equally suitable site within the district could have been obtained, for £400 an acre; a smaller site than that purchased would have sufficed; and even if the cost of the site had been as great as that of the present one, there would have been saving in other ways.

2nd. The original buildings of the hospital were erected by labour directly employed by the council instead of by contract. There was at that time a great demand for labour; and owing to the remoteness of the site the urban district council found it difficult to get men, and had to offer them special advantages. It is admitted, too, that the surveyor's control over the men was interfered with by members of the district council.

3rd. The Dowson gas plant, for which a loan of £3,631 was sanctioned by the Board on December 30, 1899, appears to be a costly failure. It is stated that the cost of making the gas is 7*d*. per 1,000 cubic feet, while that of coal gas in Chingford is 3*s*. 4*d*. per 1,000 cubic feet; but as the Dowson gas has only a quarter the heating power of coal gas, the advantage is not so

great as at first sight appears. (At the time when the loan was sanctioned coal gas was not available.) Owing to the poisonous character of the Dowson gas the Board stipulated that it should be odorised, and that it should not be used for indoor lighting purposes or inside any wardblock. Hence its usefulness is much limited, and it is only used for cooking, for working gas engines to drive dynamos for electric lighting, and for warming the wards, by means of hot water heated in geysers placed in sheds outside. For the latter purpose it is not found satisfactory, and the two new wardblocks above described are warmed by hot water from an ordinary circulating boiler heated by a coke fire—a pump worked by electricity being used to aid the circulation. In the kitchen an unpleasant smell from the Dowson gas was perceived by us, although an electric fan was in use for ventilation. The Dowson gas is said to corrode metal rapidly. The plant is all in duplicate, and the generator has to be constantly alight, the anthracite burning to waste when no gas is being made, as the capacity of the gas-holder is not sufficient to allow any considerable period of rest, and extinguishing and relighting the generator at short intervals would interfere with the proper making of gas.

The following account of the experience of the working of the cubicle block, subsequent to the date of our visit, is taken from the annual reports of the medical officer of health.

In his report for 1906, he states that the cubicle pavilion originally intended for acute cases of scarlet fever was largely used for cases of mixed infection, admitted or acquired in hospital, and for the doubtful cases, and hence the advantages originally claimed for it in the treatment of scarlet fever could not be properly estimated. However, the ease of administration and its inexpensiveness compared with other pavilions were proved, as well as the possibility of treating cases of scarlet fever, measles, diphtheria and varicella in the same block without bringing infection from one patient to another. One notable feature was the comparative absence in the patients treated in the cubicles of rhinorrhœa, otorrhœa and other complications, as contrasted with previous years.

In September, 1906, owing to diphtheria cases occurring among scarlet fever convalescents, the large convalescent block was emptied of patients, the wards disinfected, and a fresh start made, the throats of the nurses and ward maids having been examined bacteriologically. However, within a week of the re-opening of the ward a fresh case of diphtheria arose, and it was concluded that the infection must have been present in the patient prior to his admittance to the block. Henceforth all acute cases of scarlet fever were examined for diphtheria, with the result that 29 were found to be suffering from both diseases on admission, and, in consequence, were isolated throughout. In this connection the cubicle pavilion was of the greatest service, and no further cases of post-scarlatinal diphtheria occurred.

In his report for 1907 he says:—

"The cubicle pavilion has fulfilled the hopes entertained at its inception, and in not a single instance was infection carried

from one patient to another by nurses or others, although persons suffering from various infectious diseases were nursed side by side."

A similar remark is made in the report for 1908, and the annual report for 1909 contains a report on the cubicle block by Dr. Jessie Gellatly, resident medical officer, which has been already quoted in Chapter VI. of this report, *see* page 35.

24.—West Ham County Borough.

Plaistow Hospital.

The fever hospital of the West Ham Town Council is situated at Plaistow, within the borough. It was erected by means of a loan raised under a local Act of Parliament, the sanction of the Board not being required. The Board have, however, refused sanction to loans for its extension, on account of the crowding of buildings on the site, and recommended instead the establishment of a hosital for convalescents in the country, and the town council have now purchased an estate at Harold Wood, Essex, with an existing house which has been made into a convalescent home. They have also a separate small-pox hospital at Dagenham. The hospital was visited by me on June 20th, 1911, in company with Dr. Biernacki, medical superintendent. The site at Plaistow is $3\frac{3}{4}$ acres in extent, and is completely surrounded by streets, preventing extension. These streets are about 40 feet wide, and on the other side of some of them are small houses. The site is crowded with buildings, and some of those which might contain infected objects, as the disinfector house and the mortuary and post-mortem room, abut on the boundary, while some of the wardblocks come within a few feet of it. The wardblocks are tall two-storey buildings, and they are connected together by two-storey covered corridors which still further obstruct the circulation of air. There are seven two-storey blocks, six of which contain on each floor a large ward with 12-16 beds, and a side ward of one to four beds; two of them also have attached open shelters for four beds each. The seventh block is divided into smaller wards for isolation purposes. The total number of beds and costs, including those in the shelter, is 212, of which 113 are assigned to scarlet fever, 55 to diphtheria, 28 to enteric fever, and 16 for isolation purposes. The staff is 63; the cases are all more or less acute, as the convalescents are sent to Harold Wood. The wardblocks contain a single main ward on each floor. The duty room and the smaller separation ward are at one end of the block adjoining the corridor. The annexes containing water-closets, slop sinks, bath rooms, &c., are entered from the side of the ward in the middle of its length, a position which is found more convenient for nursing, and especially for carrying out the "barrier system" than one at the end of a long ward. The wall space in the main wards is 15 feet per bed. The walls of the wards are painted; the floor is of teak and in good condition. The corridors are lined with salt-glazed bricks and their floors are of a special material invented by the borough engineer, and

are also good. The wards are heated by steam pipes and radiators, also by central double stoves with upright faience flues; these rather obstruct the view of the wards, but assist ventilation. The steam is useful for heating the sterilisers used in the "barrier" nursing, being cheaper for this purpose than gas, and also for steam inhalation in throat cases. An apparatus has been designed for this latter purpose which cost £18 for a single jet, and £30 for the jets to furnish steam for two patients at the same time—it could now probably be made for less—but is said to save 25*s*. per week per jet in continuous use over the methylated spirit lamps previously used.

The "barrier system" of nursing as carried out at this hospital has been already described in Part I., chapter VI. of this report.

Dr. Biernacki tells me that in spite of the proximity of this hospital to small houses in the adjoining streets no excessive incidence of infectious disease on these houses has been observed. He also says that the journey of 10 miles to Harold Wood in a motor ambulance is not found harmful to the convalescents, and is rarely objected to by parents.

This hospital has been a very expensive one. The site cost £7,718, or over £2,000 per acre. The buildings cost £131,581 and the furnishing about £7,656, or some £36 per bed. The cost of buildings, however, included that of a public disinfecting station, for which the architect's estimate was £628; deducting this the total cost of the hospital was £146,327, or for 212 beds £690 per bed, or without site £653.

Footnote to page 10.

In an article on "The relation of housing to the isolation of scarlet fever and to return cases" (Trans. Epidem. Section, R. Soc. Med., April, 1912), Dr. M. B. Arnold shows by comparison of series of home and hospital-treated cases that even when return cases are included there is, in spite of the worse home conditions, a big gain in the hospital group, the number of susceptible persons infected being less than half that in the home group.

Footnote to page 38.

In an article in the "Lancet" of March 16, 1912, Drs. Rundle and Burton describe a system of "Bed isolation" practised at the Fazakerley Hospital, Liverpool, in which a system of antiseptic nursing somewhat different from the "barrier system" at Plaistow is applied to the whole of the beds in a ward, with, it is claimed, good results in the prevention of cross-infection.

APPENDIX A.

On the provision of Isolation Hospital Accommodation by Local Authorities.

This memorandum is designed to represent to those who are responsible for the health of communities the importance of providing hospital accommodation for the isolation of cases of infectious disease, and of doing so before the actual invasion of their districts by such disease. It is further intended to indicate to local authorities, more especially to those of districts of small or moderate size, the means by which they may most advantageously make such provision. Some general principles to be held in view by all authorities who propose to provide, by means of loans sanctioned by the Local Government Board, isolation hospitals for their districts will be set forth in the course of the memorandum. Those in italics are points which the Board regard as indispensable.

The provision of hospital accommodation for cases of infectious diseases is to be regarded primarily as a measure of sanitary defence, for the protection of the public against the spread of these diseases. It is true that such accommodation incidentally serves other useful purposes. Thus, it is frequently of value for the relief of individuals suffering from infectious disease, whose sufferings may be alleviated and their recovery promoted by affording them better accommodation and attendance than they are able to obtain at their own homes. Or it may be the means of avoiding serious inconvenience and pecuniary loss, as when infectious disease breaks out in a school, a lodging house, or a place of business. But, nevertheless, the most important function which such a hospital serves is that of the isolation of the first cases of infectious disease with a view to preventing its further spread in the household or locality invaded.

In order that a hospital may fulfil this function it is essential that it should be in readiness beforehand. Experience has shown that on the invasion of an epidemic, a hospital, even of a temporary kind, can seldom be provided and got ready for use until the time when it would have been of most service is past. The accommodation, moreover, which is required when an epidemic has become established is on a larger scale than would have sufficed for the isolation of the first cases; and hospitals hurriedly erected during the stress of an epidemic are never satisfactory in construction or suited to the permanent needs of the district.

An isolation hospital being intended primarily for the protection of the public at large rather than for the benefit of individuals, it is undesirable that admission should be subject to restrictive charges and conditions which may tend to prevent the use of the hospital by the poorer portion of the community; that is to say, by those who have the least facilities for isolation and treatment at their own homes. In some districts, however, *e.g.*, at health resorts, it may be advisable to provide special accommodation of a superior kind, such as private wards, for persons willing to pay for it.

Area to be served by a hospital.—The extent of area for which an isolation hospital may serve will depend in some degree upon considerations of local topography. If the area be too large the usefulness of the hospital will be diminished, owing to the difficulties attending the conveyance of patients over long distances. But, on the other hand, the unnecessary multiplication of small hospitals is to be avoided on grounds both of economy and of efficiency. As compared with that of several smaller hospitals, the establishment of a single hospital containing an equal number of beds saves the cost of duplicating various buildings, appliances, and officers; it facilitates the classification of patients according to the diseases from which they are suffering; and it enables a more efficient staff

to be maintained, since the hospital is less likely to remain empty for considerable periods. Hence, where districts are not very large or populous, combination for the purpose of providing hospital accommodation is often of advantage. In the less densely populated parts of the country, a market town with the surrounding rural district, or the several sanitary districts comprised in one poor law union, may form a convenient area for the purpose of combined hospital provision. A hospital intended solely for small-pox may often with advantage serve a larger area than a hospital for other infectious diseases. The modes by which local authorities may combine for the provision of hospitals are set forth in an office memorandum on "Isolation Hospitals," which may be obtained on application, for the guidance of local authorities desirous of such combination or of establishing hospitals under the sanction of the Local Government Board.

Size of hospital in proportion to population.—The amount of permanent isolation hospital accommodation which should be provided in proportion to the population will depend upon various considerations, among the most important of which are the character of the district, whether urban or rural; the rate of increase of population; the housing and the habits of the people; and the amount of intercourse with other places from which infectious disease may be introduced. As a rough estimate, one bed for every thousand inhabitants is sometimes adopted, but in view of the diverse circumstances of different districts this cannot be regarded as a definite standard. Moreover, the sufficiency of the hospital accommodation will depend not merely upon the aggregate number of beds, but also upon the way in which they are arranged in wards. In a single block with wards connected together only one disease can safely be treated at a time; and thus, at a hospital containing only one such block, occasions may arise when, owing to the hospital being partly occupied by one disease, a case of a second disease requiring isolation cannot safely be taken in, although there may be a number of beds empty at the time.

It is common to find that the demand for hospital accommodation, when people have come to appreciate the benefits of its use, increases far beyond what was at first anticipated; and for this reason, as well as to allow for growth of the population, and for the possible need for temporary extensions during epidemics, it is well at the outset to provide for the contingency of future enlargement.

Site.—In selecting a site for an isolation hospital the following considerations should be had in view:—It should be convenient of access, and, as far as practicable, central for the population and area which it is to serve; but of course not in a very populous neighbourhood. (In the case of hospitals in which small-pox is intended to be received the choice of site must be specially governed by considerations as to the number of inhabitants in the neighbourhood, which will be referred to later on.) It will be of much convenience if sewers and a public water service are available; but, if not, a sufficient supply of wholesome water must be provided, and arrangements will have to be made for the treatment of the sewage by application to land, due care being taken to avoid pollution of any well or spring or of any river. The site should be in a healthy and open situation with a dry subsoil, and should be preferably of a compact and regular shape, and not too steep. Its area will depend upon the size of the hospital, and, except in the case of a very small hospital, should rarely be less than two acres; indeed it is well to obtain a larger site than may at first be required, in order to afford space for subsequent extension if necessary. More land, too, will be needed if the sewage has to be disposed of on the site. *The site, or so much of it as is to form the grounds of the hospital, should be enclosed by a wall or close fence at least* 6 *feet* 6 *inches in height, and every building which is to contain infected persons or things should be at least* 40 *feet distant from the boundary.**

* If desired, an open unclimbable railing may be substituted for a wall or close fence for so much of the boundary as is within supervision and control from the administration block or porter's lodge, as between the points X-X on the annexed block plan A, but in that case a second line of unclimbable fence should be constructed within the first, as indicated on the plan. In very unfrequented situations a stout hedge or shrubbery between two rows of barbed wire fencing or unclimbable iron railing may sometimes suffice in place of a wall or close fence.

Hospital buildings.—These should be of three classes, viz.: 1st, ward-blocks for the reception of the sick; 2nd, administration-block for the housing of the staff and stores; and 3rd, out-offices, as laundry and mortuary. In hospitals for permanent use these buildings should be of brick or stone. Temporary buildings, as, for instance, buildings constructed of wood or corrugated iron, are ill suited for permanent use as hospitals, for the reason that it is difficult to maintain them at a proper temperature during extremes of hot and cold weather; moreover they are less durable than brick or stone buildings, requiring more frequent repairs in order to keep them in a properly weather-proof condition, and they are liable to be destroyed by fire and storm. *It is not the practice of the Local Government Board in ordinary cases to sanction loans for iron hospitals or for hospital buildings of temporary character.*

Existing buildings originally designed for a different purpose, such as dwelling houses, even when of large size, are rarely found to be well adapted for the reception of patients; especially for the accommodation at one time of patients suffering from different infectious diseases. An existing house, however, may sometimes serve as the administration-block, if it have sufficient land attached on which to erect ward-blocks.

The *administration-block*, which should be kept free from patients and infected articles, should be so placed as to control the entrance to the hospital grounds, unless a porter's lodge is intended to be erected. It should contain quarters for the matron or caretaker, and a sufficient number of bedrooms for the nurses and servants who will be required to work the hospital when in full operation; also a nurses' sitting room; a kitchen (preferably in a one-storey projection with top ventilation), store rooms, dispensary, &c. In hospitals of considerable size quarters for a resident medical officer will also be necessary. It is well to provide in the administration-block accommodation on a scale somewhat in excess of what may be at first required, in order that it may be available for future extensions of the hospital, temporary or permanent; but in any case the block should be so planned that it can be easily enlarged in the future if necessary.

The *ward-blocks* should be one-storey buildings, unless where in exceptional cases or at large hospitals exigencies of space may render it necessary to construct blocks of two storeys; in such case each storey should have a separate entrance from the open air. The annexed plans illustrate two different types of ward-block suitable for small or moderate-sized hospitals. The type illustrated in plan C is the most advantageous, as regards both cost of construction and convenience of administration, where a number of patients of both sexes suffering from the same disease have to be treated at one time. The number of beds in each ward will vary with the requirements of the district, and it is sometimes found desirable to make one ward rather larger than the other, as indicated on the plan, in order that young children of both sexes may be treated in the women's ward. The space in the centre of the block over the nurse's duty room and entrance hall (the height of which need not be so great as that of the wards) is sometimes utilised as a day-room for convalescent patients.

Plan B shows a ward-block with small wards separately entered from the open air under a verandah. Accommodation of this kind is useful not only for cases of a second disease, but also under a variety of circumstances, as for the keeping under observation of a case of doubtful nature; for the segregation of a complicated, delirious, or offensive case; or as private wards for paying patients, &c.

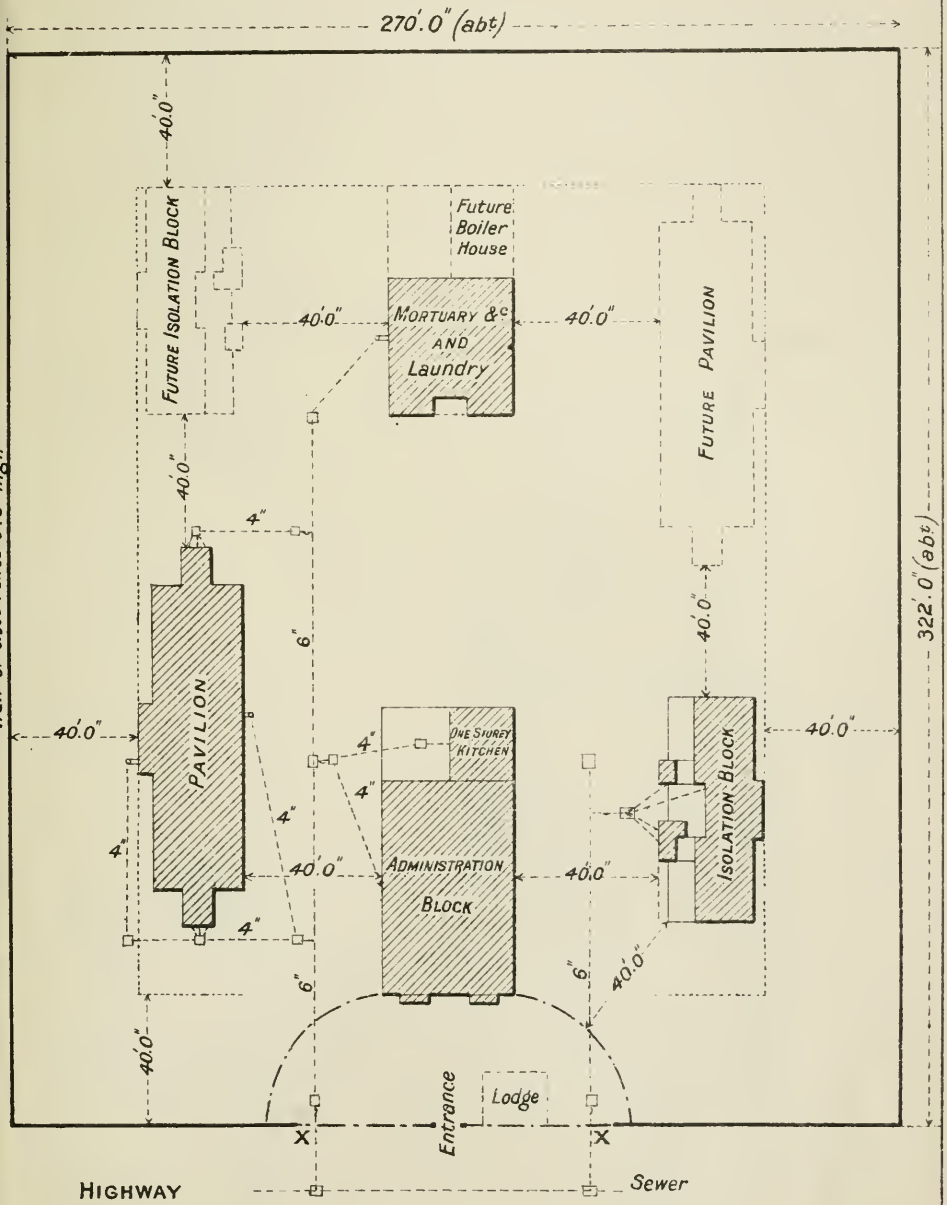
Single-bed wards in connection with a block of the type of plan C are sometimes found useful for the segregation of a case of the same disease as that treated at the same time in the main wards, but small wards so situated cannot be safely used for patients with a different disease, or for cases of which the nature is still doubtful. A convenient position for such single-bed wards is indicated on the plan.

For very large hospitals other types of ward may be found of advantage.

In the ward-blocks each bed must have at least 12 *linear feet of wall space*, 144 *square feet of floor space, and* 2,000 *cubic feet of air space.* In calculating the latter any height of wards above 13 feet should not be taken into account. The walls should be of adequate thickness; and the

A.

Block Plan.



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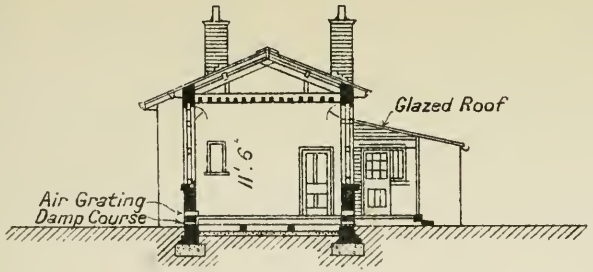
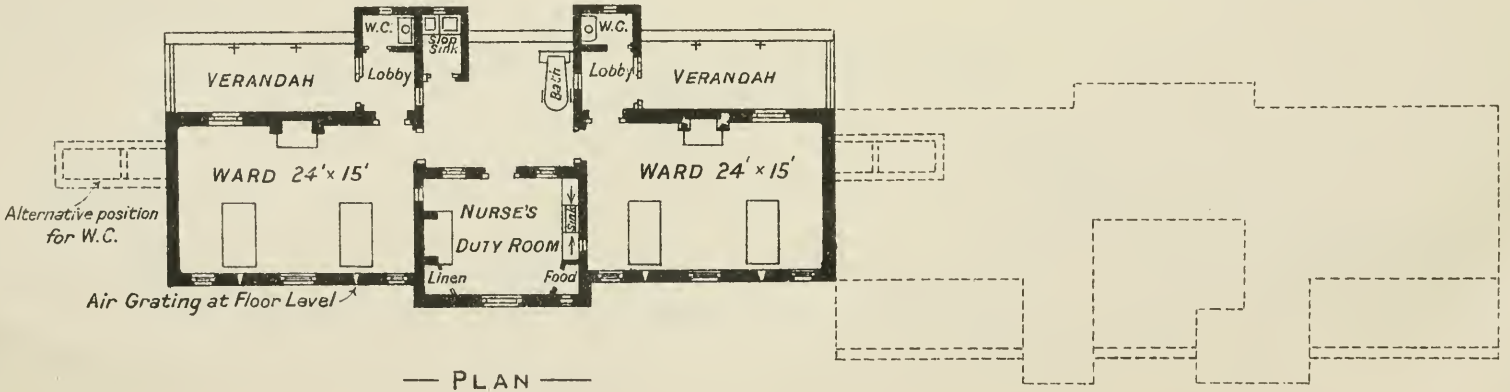


— SECTION —

NOTES. *In a double block on this pattern the entrances and verandahs should be on alternate sides as here illustrated*
If the verandahs are enclosed it should be only by a movable screen so arranged that it can be taken away altogether as circumstances require.



— PLAN —

B.

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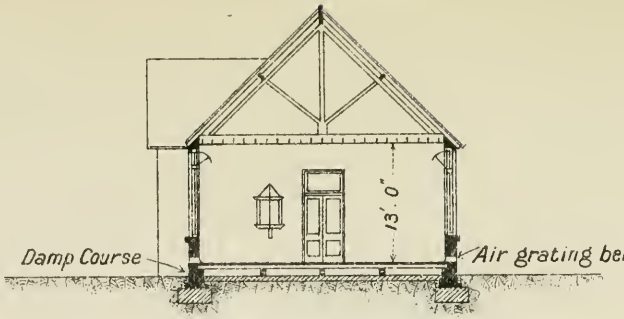
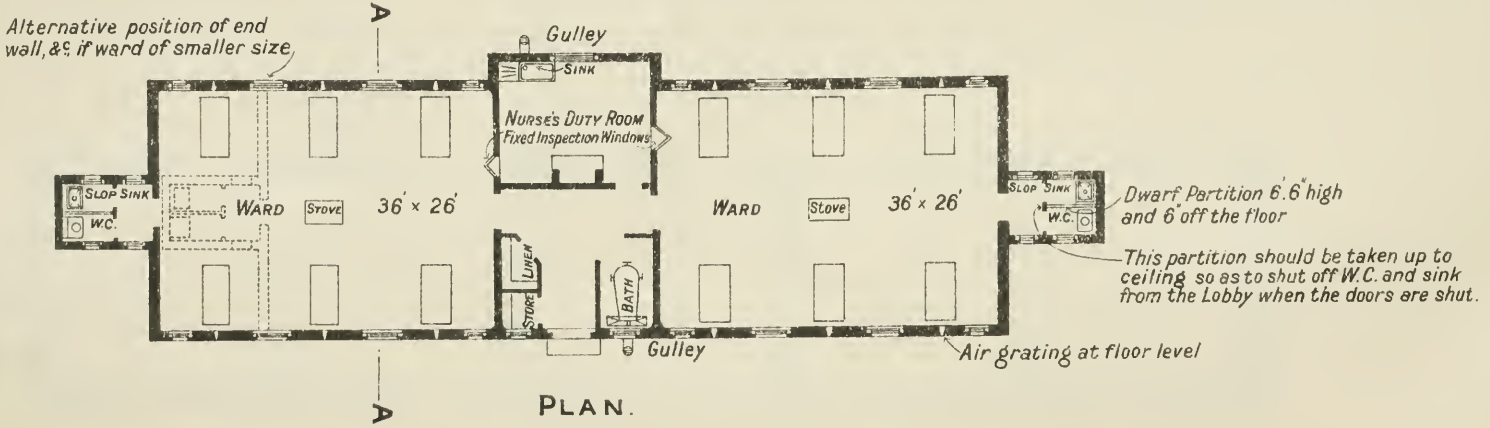


SECTION A.A.

ALTERNATIVE PLAN.

SHEWING 2 SEPARATION WARDS



PLAN.

C.

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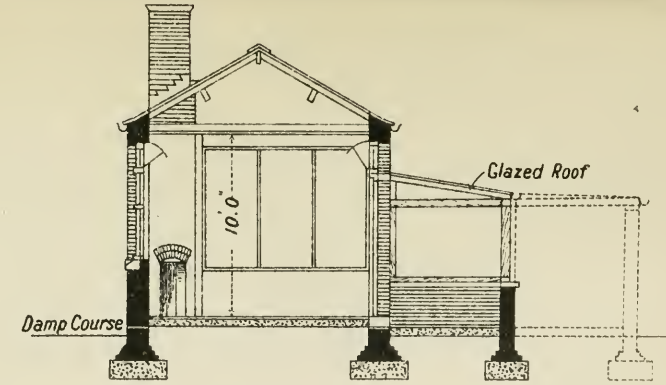
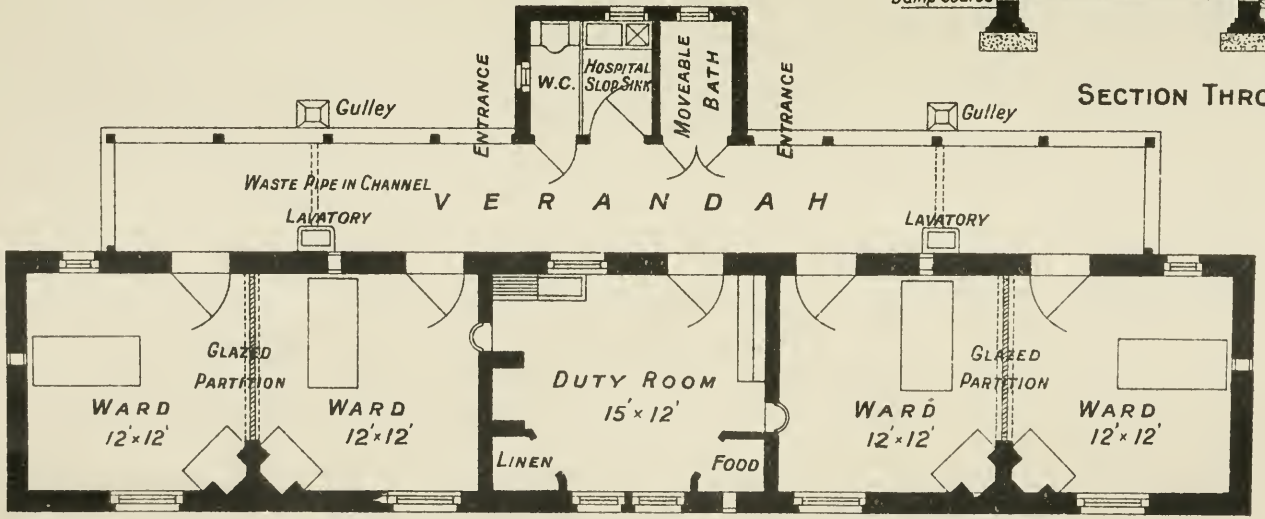


SECTION THROUGH WARD.



PLAN.

D.

Malby & Sons Lith

inner face of the walls as well as the floors and woodwork should be constructed with smooth impervious surfaces and rounded angles, so as to facilitate cleanliness and to avoid spaces which may harbour dust and dirt. Ventilation should be by windows on opposite sides of the ward; the windows should be double-hung sashes with fanlight above, and the fanlight should be made to fall inwards, hopper-fashion, with side cheeks to prevent down draughts. The area of the windows should be sufficient but not excessive; one square foot of window to every 70 cubic feet of ward space is a suitable proportion. The best aspect for the ward-blocks is usually with the windows facing respectively south-east and north-west. The wards should have adequate means of warming, which may with advantage be so contrived as to furnish a supply of warm fresh air. An ample supply of hot water for baths should be provided, and bath rooms should be capable of being warmed. The closets and slop-sinks should be placed in annexes separated from the wards by cross-ventilated lobbies. The closets should be water-closets where practicable; and the slop-sinks should be of an appropriate pattern adapted to receive the solid and liquid contents of bed-pans, the waste-pipe being 3 inches in diameter and arranged similarly to the soil-pipe of a water-closet.

The *out-offices* will comprise such buildings as laundry, disinfecting chamber, mortuary and ambulance shed; and in large establishments a boiler house and engine house may be needed. Except in very small hospitals, the laundry should comprise a wash house, a drying closet, and an ironing room. An apparatus should be provided for the disinfection by steam of bedding and articles which cannot be washed. The mortuary should be in a cool and unobtrusive position, and should be lighted from the north only.

A discharging-block is not unfrequently provided, consisting of an undressing room, a bath room, and a dressing room, in which convalescents may take their final bath and put on clean clothes before leaving the hospital.

Each building which is to contain infected persons or things should be at least 40 feet distant from any of the other buildings.

The drains of each block should be trapped from the common drain and ventilated separately by an inlet just above the trap and by ventilating shafts at their highest points.

The annexed block plan A illustrates the arrangement upon a rectangular site of about two acres of a hospital containing 16 beds, in two ward-blocks with administration-block and out-offices; space being also reserved for future extensions. The best arrangement of the buildings will, however, in practice largely depend upon the shape and contour of the site.

If, owing to the bleakness of the site, it is considered desirable that the several blocks should be connected by covered ways, these should not be enclosed, but should be open at the sides. A screen for protection against wind and driving rain may be provided if desired.

Hospitals for Small-pox.—In view of the frequently demonstrated liability of small-pox hospitals to disseminate that disease to neighbouring communities, and in order to lessen the risk of such occurrence, the Board require the following conditions to be complied with in the case of small-pox hospitals provided by means of loans sanctioned by them:—

1st. *The site must not have within a quarter of a mile of it either a hospital, whether for infectious diseases or not, or a workhouse, asylum, or any similar establishment, or a population of as many as* 200 *persons.*

2nd. *The site must not have within half a mile of it a population of as many as* 600 *persons, whether in one or more institutions, or in dwelling-houses.*

3rd. *Even where the above conditions are fulfilled, a hospital must not be used at one and the same time for the reception of cases of small-pox and of any other class of disease.*

Useful information on the administration of isolation hospitals, derived from experience of them in various parts of England and Wales, will be found in a report [C.—3290] of the Medical Department, 1882—re-issued in 1901.

W. H. POWER,
Medical Officer.

Local Government Board,
Medical Department,
May, 1902.

APPENDIX TO MEMORANDUM ON THE PROVISION OF ISOLATION HOSPITAL ACCOMMODATION BY LOCAL AUTHORITIES.

The annexed plan D for an observation block is intended to provide isolation accommodation for single cases of infectious diseases, for cases of mixed infection, or for cases of doubtful diagnosis; and is arranged in such a way that one nurse may, assuming that rigid precautions are taken, attend to more than one such case.

It will be noted that the new plan D only provides 1,440 cubic feet of air-space per bed instead of the 2,000 cubic feet required in ward-blocks. This has been permitted in view of the separation of individual patients, and the efficient cross-ventilation which the plan provides, expense at the same time being diminished.

ARTHUR NEWSHOLME,
Medical Officer.

Local Government Board,
Medical Department,
March, 1908.

APPENDIX B.

MINUTE BY DR. THEODORE THOMSON ON THE ISOLATION WARDS AT THE PASTEUR INSTITUTE HOSPITAL AND HOSPITAL FOR SICK CHILDREN IN PARIS.

The wards in the Sick Children's Hospital in Paris are modelled after the Pasteur Institute Hospital, of which an account is given in the July (1900) number of the "Revue d'Hygiène." There are certain differences in plan, but as the Pasteur Hospital is the better, I propose to deal with it in the first instance, adding afterwards some remarks on the Sick Children's Hospital.

As the plans given in the "Revue d'Hygiène" show, the Pasteur Hospital is a three-storey building with a series of cells on each floor, termed "boxes," and a convalescent ward. The boxes, each destined for a single patient, are approached from a central corridor, and also from an external balcony. Ordinarily, the access from the latter is not used; the balcony, indeed, is provided for cases which may be regarded as being so infectious or so much dreaded (*e.g.*, plague) as to render it undesirable to approach them from the central lobby. The boxes are in sets of two, each set divided from the next by a wall, while the partition between the two boxes of each set is, save in its lower portion, of glass. That side of each box that gives on the central lobby is of glass save in its lower part. Other constructive details will be found in the "Revue d'Hygiène." The service of the sick is effected by a staff of convent sisters, and, including nursing, ward-cleaning, cooking and laundry work, about one sister for three patients is found necessary. The nurse, on entering a box, puts on a long blouse which hangs there for her use, attends to the patient, takes off and hangs up her blouse, washes her hands, leaves the box, and enters another box, where she goes through the same procedure.

The patient, from the moment he enters the box to the moment of discharge (which is effected in a discharge-room), never leaves it. This is not

in accordance with the statement in the "Revue d'Hygiène," according to which the patient is, after a time, transferred to a convalescent ward. But the management of the hospital have for some time past ceased to use the convalescent wards for infectious cases, and propose to convert these wards into boxes. The convalescent wards are regarded as not free from danger to occupants even when suffering from the same infectious malady.

As regards the following points:—

1. *Avoidance of Intercurrent Infection.*

In the Pasteur Hospital all sorts of maladies, infectious and non-infectious, which the institute staff desire to study, are treated side by side in the various boxes. Half a dozen adjacent boxes may contain cases of small-pox, enteric fever, scarlet fever, measles, erysipelas, and pneumonia respectively. During the four years or thereby that the hospital has been in use, over 2,500 persons, suffering mainly from infectious disease, have been treated, and in one instance only has a patient in hospital contracted intercurrent infection. The disease contracted in the case referred to was small-pox, of which disease many cases have at one or another time been treated in the hospital.

2. *Welfare and Contentment of Patients.*

I was informed at the Pasteur Hospital that children readily accustom themselves to the solitude of the "box" system, and that educated persons, or those with a taste for reading, appear contented. But it was admitted that the working man, who generally has few resources in himself to fall back upon, finds the time pass slowly and complains of his solitude.

3. *Facility of Supervision and Administration.*

The glass partitions giving on the corridor are considered to facilitate supervision, inasmuch as the nurse, in passing along the central lobby, sees at a glance what is going on in each box. On the other hand, it is clear and was admitted on my raising the point, that unless the staff be thoroughly intelligent and scrupulously attentive as regards precautionary measures, the system may break down entirely and lead to transmission of infection from the patient in one box to that in another.

4. *Efficiency of Ventilation.*

Air, which in cold weather has been previously warmed by being passed over steam pipes, is admitted to each box by an opening near the floor, and is extracted (by aspiration) from another opening near the top of the box. In each cell I entered the temperature was pleasant and the atmosphere sweet, and the occupant always informed me that there were no draughts. Draughts, however, are less likely to be noticed when the incoming air is warm; it is therefore possible that at times of year when it is not considered necessary to warm the air draughts might occur.

5. *Closet Arrangements.*

Water-closets are provided on each floor, as shown in the plans in the "Revue d'Hygiène." But they are not used by the patients in the boxes, who, as I have said, do not leave their box until they are ready for discharge. Bed-pans and commodes are used in the box; creolin is added to the contents, which are then put down a slop-sink.

In regard to this matter, in the application of the system in England difficulties are likely to arise. The use of a commode in a cell commanded by other cells, as well as from the lobby, is not likely to find favour in English eyes, and the use of water-closets, unless one were provided for each box, might tend to spread infection. It is true that privacy might be secured for the user of a commode in the box by means of a folding screen which might be laid against a wall when not in use. Even then, however, the fouling of the air that would result might be disliked by the occupant.

6. *Cost of Construction and Administration.*

Dr. Roux, who took me over the Pasteur Hospital, put the cost of construction at £480 per bed. I am not sure, however, whether Dr. Roux's estimate may be taken as correct; the architect's information on this point (which I do not possess) would be more trustworthy. In any case, actual cost in France is not likely to be the same as in England. Dr. Roux was clearly of opinion that the hospital was much more costly to construct than an ordinary hospital for infectious diseases; but it has to be borne in mind that a good deal of unnecessary expense has been incurred in providing somewhat luxurious fittings and in using ornamental materials. The only index as to cost of administration that I have is the proportion of staff to patients, already stated, and the need for a highly trained and intelligent staff, which points to greater expense in wages. The actual staff at the Pasteur Hospital receive pay which is almost nominal, because of the fact that the sisters who discharge the duties do so as an act of Christian charity, and desire only that their convent shall not be out of pocket. What they do get practically covers little more than wear of clothing.

The Sick Children's Hospital wards built after the Pasteur Hospital plan differ in having no external balcony, in having the bath room for admissions badly placed, and in being less satisfactory as regards some internal fittings. The boxes are not in sets of two with solid walls between the sets; all partitions between boxes are of glass, except in their lower portion, so that a clear view of the boxes is commanded from end to end. This advantage, however, is lost when, in cases where privacy is desired, the glass is covered with a coating of whitewash. The ward which I visited was in use for measles only, and I noted that the box doors giving on the central lobby were all left wide open. This because danger of aerial transmission was regarded as practically nil; contact, direct or indirect through the nurse, is considered to be the source of transmission. In this hospital patients that have passed the acute stage without developing complications likely to be transmitted to others, such as broncho-pneumonia, are transferred to a convalescent ward. If any case in the convalescent ward develop a transmissible complication it is re-transferred to a box. The hospital authorities claim that by this system of isolation dangerous complications after measles have been reduced to a minimum with marked diminution of fatality of the disease.

Dec. 11, 1903.

APPENDIX C.

Notes by Dr. Parsons on the Relative Cost of Isolation Hospitals and Lunatic Asylums.

The following remarks have reference to the relative cost, reckoned per bed, exclusive of site, of isolation hospitals and of lunatic asylums erected in recent years—*i.e.*, since 1890—the buildings in the case of hospitals (? always in that of asylums) being permanent buildings of brick and stone. The cost of modern lunatic asylums, as calculated from figures given in Table VIII., Appendix B, of 59th Report of the Commissioners in Lunacy, lies usually between £200 and £350 per bed, average £288—without site—ranging from £158 London, (Manor Asylum), and £187, Isle of Wight to £402, West Ham and £483, Croydon. (In the latter case, I understand that the high cost was largely due to the distance of site from a railway station and consequent expense of cartage of materials along hilly roads.) The cost of site is about £20 per bed. The cost of permanent isolation hospitals complying with the Local Government Board's requirements varies greatly in different cases, but may be taken as usually about £400 to £500 per bed, exclusive of site. Where circumstances are favour-

able and economy is exercised, it may be between £300 and £400 per bed, but it is rarely below £300, and on the other hand it may run up to over £800 per bed. Very high figures per bed are usually due to either—

I. the hospital being a very small one so that the cost of the necessary equipment is divided between very few beds;

II. difficulties of site involving extra expense in such matters as excavation, foundations, drainage, and water supply; and

III. want of due regard to economy in design and control over cost of erection.

The following considerations may help to explain the difference in cost per bed of the two classes of establishments.

Size.—Few county or borough asylums contain accommodation for less than 300 patients; the only ones in the table before-mentioned being Canterbury, 173; Plymouth, 200; and York (Scalebor Park), 246. On the other hand, few isolation hospitals, except those of the Metropolitan Asylums Board, which contain from 345 to 940 beds, have so many as 100 beds, the number being more generally some 20-50 (the usual estimate is one bed per 1,000 population). The cost of a small hospital tends to be greater in proportion than that of a larger one, for certain items of accommodation are necessary for a hospital, however small, although they would serve equally well for a larger one until the point is reached at which duplication becomes necessary. By way of illustration, a hospital containing only two single-bed wards—two beds only—might require, if there were in it patients who were seriously ill, a day nurse and a night nurse, for whom accommodation would have to be provided; but the same number of nurses might serve if the wards contained four beds each, in which case the cost of the nurses' quarters would be divided by eight instead of by two. If a second similar block were added, the number of nurses to be housed would be doubled, but one caretaker might still suffice; and so on with other matters.

Cost of Site.—As regards amount of land required per patient, there is not much difference between asylums and hospitals; the Lunacy Commissioners recommend not less than one acre to every 10 patients; the Board recommend not more than 20 patients per acre, but in practice the proportion of beds per acre is generally less. The Commissioners recommend an area of not less than 50 acres; the Board one of not less than 2 acres. But land for an asylum seems to be obtainable at a much cheaper rate per acre than it usually is for an isolation hospital, and commonly under £100 per acre, except in the neighbourhood of large towns. This may be due to the following circumstances:—

I. There is more choice of site; an isolation hospital must be in or near the district which it is intended to serve; an asylum may be anywhere in or near the county.

II. There is probably more objection to an isolation hospital in the neighbourhood than to a lunatic asylum, and hence less readiness to sell land for the purpose.

III. It may be easier to obtain land in large parcels, as for the foregoing reasons the opportunity may be taken of an estate coming into the market to purchase it for an asylum, whereas for hospital purposes an authority, in order to get a site at all, has often to buy a larger or more costly one than it requires.

Classification of Patients.—This is necessary in both classes of establishments, but the greater number of inmates makes it less costly in an asylum than in an isolation hospital. A greater separation of the sexes is needed in an asylum than in an isolation hospital; but, on the other hand, a more complete separation of diseases is needed in an isolation hospital, where different infectious diseases must be treated in wards aerially distinct from one another. More patients can be lodged in one ward in an asylum than in a hospital. Thirty to 50 beds is the number recommended by the Commissioners, while 20 beds is a large number in a hospital ward, and a greater number of small wards in proportion to the total number of beds is probably required in an isolation hospital. The dividing up of the beds among many buildings and wards, of course, adds to the expense per bed.

Standard of Space per Patient.—In isolation hospitals the Board's standard of space in wards for acute cases of fever are 12 linear feet of wall space, 144 square feet of floor space, and 2,000 cubic feet of air space. In asylums the Commissioners prescribe 50 feet of floor space per bed in dormitories and 63 feet in single rooms, with a height of not less than 12 feet; these dimensions give cubic spaces of 600 cubic feet per bed in dormitories and 750 cubic feet in single rooms. In infirmary wards the floor space should be 67 square feet in dormitories and 84 square feet in single rooms—804 and 1,008 cubic feet respectively. These amounts are only from one-third to one-half the Board's standard for isolation hospitals. In the isolation hospital attached to an asylum, however, the Commissioners require not less than 2,000 cubic feet of space per patient—a standard the same as the Board's.

As regards the proportion of patients of different classes at an asylum the Commissioners say that as an approximate rule the provision should be in the following proportions:—

	Per cent.
Sick and infirm	25
Epileptic	15
Recent and acute cases	20
Working and quiet chronic cases	40

Roughly speaking, we may perhaps say that for half the patients the accommodation required would be of a kind comparable as regards cost to that in a workhouse; for one-fourth, comparable to that in a workhouse infirmary or a general hospital (where the standard of space is 1,000 cubic feet per bed); and for one-fourth—viz., the recent, acute, and infectious cases—of a kind comparable to that in an isolation hospital.

Accommodation for Staff.—In asylums the Commissioners say that the total accommodation for attendants, inclusive of those on night duty, should be sufficient to provide for one attendant to every $8\frac{1}{2}$ patients; this does not include the whole staff, but a good deal of the work of the asylum is done by those of the patients who are able. Perhaps the number of staff may be estimated as one per seven inmates. In isolation hospitals the number of the staff required will vary according to the nature and severity of the cases and the number of wards among which the beds are divided—it may perhaps be estimated as one for every three patients. (*See* table on next sheet.) In an asylum the staff are lodged like the patients in the main building. In an isolation hospital separate quarters for the staff are provided in an administration block.

Twelve Asylums taken at random.	Census, 1901.		
	Beds, 1904.	Patients.	Officials and Families.
Gloucester { Barnwood } ... ... { Wootton }	1,106	401 683	75 95
Bristol	955	861	109
Portsmouth	708	687	119
Isle of Wight	318	315	48
Hants	1,166	1,099	200
Herts	576	522	79
London—Bexley	2,114	1,886	233
City of London	572	518	63
Kent—Barming	1,425	1,360	164
Lancaster—Co.	2,075	2,000	256
Leicester—B.	868	611	82
Total	11,883	10,943	1,523

Beds occupied in 1901, 92 per cent. of the number existing in 1904.

Officials and their families equal 14 per 100 patients, or 12·8 per 100 beds.

Twelve Large Isolation Hospitals.	Census, 1901.		
	Beds, 1901.	Patients.	Officials and Families.
Bristol { Novers	56	60	13
Bristol { Ham Green	76	94	39
Portsmouth	92	50	25
Southampton	70	18	35
Watford	42	31	18
Bromley and Beckenham Jt.	72	31	23
Salford—Ladywell	396	187	57
Manchester Monsall	416	428	176
Croydon	142	73	44
Liverpool—Netherfield	140	99	49
Liverpool—Grafton St.	80	54	37
Leicester	154	93	37
Total	1,736	1,218	553

Beds occupied, 70 per cent.

Officials and their families (if any), 45·5 per 100 patients; 32 per 100 beds.

Equipment.—There is probably not much difference as to the requirements of an asylum and an isolation hospital in the way of furniture, &c. Perhaps those of the former may be more costly in view of the habits of destructive or suicidal patients. There is this difference between the two establishments, that an asylum is always occupied, whereas an isolation hospital, especially a small one, may be often empty or nearly so for considerable periods of time. Hence it will doubtless be more worth while in the former than in the latter to adopt appliances such as steam heating from a central boiler, laundry machinery, and electric lighting for the sake of convenience and the saving of labour and cost of maintenance which they effect, although they add to the first cost of the building.

Fencing.—Assuming that the same sort of fence will be necessary, the cost of fencing a large site is less in proportion than that of a small one. Of two sites of similar shape, but one having sides twice as long as the other, the larger site will have twice the length of boundary but four times the area of the smaller one.

Cost of Asylums.

——	Date.	Cost of Land.	Cost of Buildings.	Patients.	Cost per Bed.	
					Land and Buildings.	Buildings.
		£	£		£	£
Brecon and Radnor	1903	11,632	124,369	352	387	385
Herts	1899	10,704	176,388*	576	325	305
Lancaster—Winwick	1902	21,750	431,635*	2,050	220	210
London—Bexley	1898	24,485	429,529*	2,000	226	214
„ Claybury	1893	39,415	491,959	2,226	237	222
„ Manor	1899	3,710	120,884	762	182	158
„ Horton	1902	7,806	459,324*	2,000	233	229
„ Epileptics	1903	4,219	90,503*	325	291	278
Nottingham	1902	6,880	147,086	452	340	325
Sussex, E.	1903	24,746	315,275*	1,115	353	338
Sussex, W.	1897	24,746	219,442	783	311	280
Isle of Wight	1896	4,916	59,198	318	202	187
Canterbury	1903	10,000	619,110	250	337	297
Croydon	1903	4,298	210,893	435	493	483
Plymouth	1891	4,690	64,776	200	346	323
West Ham	1901	20,869	322,149	800	428	402
				Average	308	288

* Payments not yet completed.

APPENDIX D.

Memorandum on the Cost of Isolation Hospitals.

By B. T. Kitchin, F.R.I.B.A., Architect to the Board.

I.—*Rise in Cost of Labour and Materials.*

In considering the increasing cost of isolation hospitals it is evident that this is not due to any single cause but to a series of conditions and causes which may perhaps be collectively described as evolutionary. It is unnecessary to refer to the fact that in every subject that has any scientific basis there has been an inevitable advance in ideas, experiment and experience, which has brought with it a consequent advance in requirements and expectations and an increase in the cost of materials and fittings and a greater demand for a higher standard. And, again, the social advances which have taken place in England during the last half century have brought with them a corresponding increase in the cost of labour. Thus, while in 1850 the average rate of wages (London area) was for bricklayers, masons, carpenters and joiners 6½*d.* per hour, plasterers, smiths and painters 6*d.* per hour, and plumbers 7*d.* per hour; the rate for these trades had risen in 1875 to from 7½*d.* (painters) to 9½*d.* (plumbers), and is now 8½*d.* (painters) and 11*d.* (plumbers and plasterers) at Trades Union rate of wages.

The cost of brickwork has increased principally as a result of the additional cost of labour, and where Trades Union workmen are employed, by the restrictions of the Union as to rate of bricklaying, &c.

In 1859 a rod of stock brickwork in mortar cost approximately £12 10*s.* (labour = £2).

In 1875 a rod of similar brickwork cost £15 (labour = £3 5*s.*).
„ 1904 „ „ „ £16 10*s.* (labour = £5 10*s.*).
„ 1911 „ „ „ £16 5*s.* (labour = £4 9*s.*).

Materials, with the exception of Portland cement which has fallen considerably since 1900, have risen in price from 1895 till 1910. There was a considerable rise in the cost of materials in 1899 and 1900 amounting to about 20 per cent. increase over prices in 1895. Since 1900 there has been some fluctuation but no appreciable increase.

The following percentages based on the Board of Trade returns will give some idea of the fluctuations which have taken place since 1895. The following materials are included:—bricks, Portland cement, slates, wood, iron, lead.

1895	100	1903	109·4
1896	101·3	1904	109·1
1897	102·7	1905	108·2
1898	107·1	1906	114·45
1899	115·8	1907	118·5
1900	120·9	1908	110
1901	109·3	1909	109·5
1902	106·2	1910	111·6

Other items in which the cost of hospitals has increased are (1) drainage, which now has to be laid in accordance with modern byelaws or Acts requiring more efficient means of ventilation and access to drains, more efficient construction and a better class of materials; (2) brickwork must be in accordance with the requirements of the byelaws as to public buildings; (3) in sanitary fittings and plumbing (baths, w.c. apparatus, hospital sinks, lavatory basins, &c.); (4) in general administrative requirements. The general effect upon the cost of hospitals of the various conditions which combine to make an increase in the cost of present day hospitals can be illustrated by a comparison of the cost (excluding site) of some hospitals built 25 or 30 years ago.

Hospitals built between 1885 *and* 1890.

	Number of beds.	Per bed. £
Berkhampstead	8	270
Darlington	44	225
Folkestone	14	200
Lewes	12	164
Warrington	28	234
Weymouth	26	192
Sheffield	64	309
Solihull	12	241

The cost of isolation hospitals at the present time, as Dr. Parsons states, varies between £350 to £500 per bed.

II.—*Materials.*

The use of material other than stone or brickwork for the construction of isolation hospitals has been somewhat hampered by the fact (1) that in the case of permanent hospitals, local byelaws frequently interfere with cheap forms of construction; and (2) that the period for repayment of loans must necessarily be somewhat shorter.

That there are less expensive materials which might successfully be made use of and for which a comparatively long period might be allowed does not admit of doubt and is borne out by the recommendations of the committee of the Board of Education on the cost of school buildings. At the same time there is some natural hesitation on the part of local authorities to adopt materials which are to some extent experimental and which have not undergone any test of time. Customs and tradition also play a part in the not uncommon antagonism to newer forms of construction. All builders understand the construction of brickwork and are inclined to be shy over new materials, while the bricklayer who has spent his life laying bricks does not welcome the laying of concrete or cement slabs which he cannot cut with a trowel and which are heavy to handle. The erection of sanatoria for consumptives has given considerable impetus to the use of patent and cheaper materials and there is no reason, except for the byelaw difficulty, why more use should not be made of these for isolation hospitals. Steel or timber frame buildings covered with patent slabs, such as Frazzi, Mack, "Fram slabs," &c., rendered in cement mortar or roughcast and lined internally with incombustible material would make a durable and suitable building at a saving of from 30 to 40 per cent. Where there is material readily available for the manufacture of concrete, buildings of as substantial a character as brickwork might be erected of concrete blocks made *in situ* or delivered 3 inches or 4 inches thick, with an intervening cavity between the inner and outer layer, a form of construction still more economical. Blocks of this kind can be finished both inside and outside as in brickwork. Reinforced concrete, which is a rather more expensive form of construction, requires, moreover, greater care in construction, as any defects in the composition are likely to cause fissures in the walls, which are difficult to repair and are liable to admit damp. Concrete is naturally a porous material and unless very carefully made and constructed of a sufficient thickness is liable to cause dampness in the interior of the building. The fitting of window and door frames is more difficult in solid concrete buildings owing to shrinkage of the concrete in process of drying.

A hospital pavilion for 36 beds has recently been erected by the Acton urban district council of steel framing with stanchions 12 feet from centre to centre and covered with solid concrete blocks measuring 3 feet by 1 foot and 4 inches thick. The walls are rendered externally in cement and finished inside with a hard plaster painted with waterproof paint.*

It is reckoned that the saving in labour consequent on the use of large slabs and the saving in material represent about 40 per cent. on the

* *See* page 69 of this report.

cost of brickwork required under the byelaws. The amount of the contract of this building was (excluding roads, drainage, &c.) £3,594, which represents £100 per bed, but this, of course, only represents the actual cost of the ward pavilion and does not include land, administrative buildings or contingent expenses. The cost per foot cube of the building itself (36 beds) exclusive of roads, paths, fences, drains, sanitary fittings, water mains, &c., was 4·66 pence as compared with 6·90 pence for the last built brick (brick and half hollow) pavilion (14 beds) exclusive of the same items.

The experiment is an interesting one and is worthy of study, but the success of the experiment cannot be fully tested till some years have elapsed when it may be ascertained what the effect of varying atmospheric conditions and the ordinary wear and tear of occupied buildings have had upon the structure.

A school building recently erected in Northumberland of timber framing, on a concrete foundation, covered with casing of 2-inch "Fram" slabs externally and 1-inch slabs internally and rendered externally with cement mortar and roughcast and finished internally with plaster, was erected at a cost of $5\frac{1}{2}d.$ per foot cube. The roof is covered with asbestos tiles.

In describing the building ("Builder," June 9th, 1911) the writer says, "it must be taken into consideration that the building internally is finished exactly similar to a brick or stone one and that it was found necessary to instal an accelerated hot-water installation. Other extras were also incurred, so that provided a school of this description was built on a suitable site it would be possible to erect a building which would work out at $5d.$ per foot cube or even under that figure."

A sanatorium of similar construction was erected at Harrow on a difficult and hilly site at a cost of $6d.$ per foot.

Though under favourable circumstances hospital buildings have been erected in brickwork for as low as $5\frac{1}{2}d.$ per foot cube, they frequently cost as much as $8\frac{1}{2}d.$ and $9d.$ per foot, so that where the cost of brickwork or masonry was about or above the average price per foot cube, and where the facilities for concrete or patent construction were normal, there might be a saving effected of some 30 to 40 per cent. on buildings constructed of such material as in this case as compared with brick or stone buildings.

Timber-framed buildings, covered with weather boarding or with corrugated iron, though cheap are not really economical except for temporary purposes, and, as Dr. Parsons points out, are open to certain objections. The use of such material as Uralite or Eternit or similar slabs fixed to timber framing gives a somewhat better result, but buildings constructed of such material would come within the term of temporary buildings and would have to be treated accordingly for loan period.

Where it is intended to borrow to defray the cost of the erection of hospital buildings, the question of materials to be used must necessarily be subject to careful consideration. It is doubtful if the erection of purely temporary buildings of wood, corrugated iron and similar materials is a good investment for a purpose which is to all intents and purposes a permanent one, and where such buildings are decided upon, it would be more economical and equitable to pay for them out of current account.

Buildings of more permanent material might form the subject of a longer loan period, as suggested by Dr. Parsons, though the lack of experience as to the durability of modern building materials makes it difficult to prescribe any definite period for repayment of such loans.

III.—*Estimates.*

It has not infrequently happened that schemes for hospital buildings, for which a loan based on an approximate estimate has been sanctioned, have actually cost considerably more than the amount sanctioned. This may have been due either to the estimate having been made upon too low a

basis, to an insufficient bill of quantities, to extra works having been introduced during the progress of the work, to failure of the contractor or to other unforeseen causes.

Forms upon which an approximate estimate may be made are supplied by the Board, and these forms include all the items likely to arise, but until tenders have been received, the cost of the undertaking can only be regarded as approximate. It is therefore necessary that before any loan is sanctioned a second estimate, based on a provisionally accepted tender should be submitted to the Board, and if during the progress of the work any deviation from or variation in the contract involving additional expense is contemplated the Board should be notified of the fact.

As a general rule it will be advisable to accept the lowest tender, but circumstances may in exceptional cases make it necessary to accept the second or third tender. There must, however, be sufficient and proper reasons, such as evident financial instability of the contractor or inability on the part of the contractor to provide sufficient sureties, for such a course to be adopted and the grounds for such a course should be reported to the Board.

In considering the estimates everything tending to unnecessary expense should be eliminated from the specification. Less costly but equally serviceable sanitary fittings may frequently be substituted for those selected and all unnecessary elaboration or ornamentation must be avoided.

Buildings should be so arranged upon the site as to reduce road making, drainage, water, gas or electricity services to a minimum. Offices, such as laundry, mortuary, disinfecting chambers, ambulance, coal stores, &c., should be grouped into one building so as to avoid the multiplication of small buildings.

In the selection of a site economy in haulage, foundations, water and lighting services, drainage, &c., may have a considerable effect on the ultimate cost and must be taken into account, and the proximity of the source of supply of materials and of railway facilities must not be overlooked.

Strict and careful supervision of the work during progress is very important in the interests of economy and it is desirable that a close check should be placed on the ordering of extra work or in making deviations from the contract.

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ON

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